ACTIVITY REPORT 2023

EUROARGO

EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM FOR OBSERVING THE OCEAN

Foreword

For new readers, this report summarizes information needed as a first approach to Euro-Argo ERIC. The research infrastructure coordinates the contribution of twelve countries forming the Euro-Argo in-situ ocean observing network. Embedded in the global Argo programme since its inception, Euro-Argo ensures the European ambition to support 1/4th of the fleet of autonomous profiling platforms covering the entire ocean and providing a synoptic view of the variations and evolution of essential ocean variables. This year again, responding to the needs and expectations of a growing number of scientists and operational users, a major effort has been made to amplify float deployments, for example, in polar regions and European marginal seas, including, amidst geopolitical tensions, in the Black Sea. Improved technological capabilities were also implemented to enrich the daily Argo dataset, for instance by reaching greater ocean depth or using biogeochemical sensors to address the important issue of carbon uptake by the ocean. Argo's permanent commitment is to ensure the highest data quality control: in real time for operational users in weather or ocean forecasting, as well as for the validation of satellite data; and in delayed mode for research. This has led, in 2023, to remarkable scientific publications, notably on the latest developments in the sensitive Baltic Sea and on the ability to infer the distribution of nutrients over the ocean from Argo dissolved oxygen measurements.

Regular readers of this yearly report expect not only the assessment provided by the key performance indicators, but also to understand the recent changes in Euro-Argo as a European Research Infrastructure Consortium. 2023 was a hinge year which saw the adoption by the Council of a new 2024-2033 Strategic Plan. This plan focuses on the indispensable steps, many of them specific to Europe, to meet the challenges of the new global, full-depth and multidisciplinary OneArgo programme. The Euro-Argo Scientific and Technical Advisory Group agreed on this Strategic Plan and made useful recommendations before the final approval by the Council. In 2023 too, Euro-Argo ERIC was monitored by the European Strategy Forum on Research Infrastructures (ESFRI), which confirmed the Landmark status of the ERIC. Finally, amendments to the statutes materialized, for the first time, the fact that Euro-Argo ERIC is truly a distributed European research infrastructure sharing common objectives as well as complementary tasks and skills.

In 2023, I took full responsibility for the Euro-Argo ERIC Office and the coordination of the Euro-Argo programme. This means leading a remarkable and fully committed team with matching skills, and fostering collaborations with and between the ERIC Members. It also means building bridges with other research infrastructures, in particular those with which the European Ocean Observing System (EOOS) is being created. Together, Office and Members, we enjoy the trust bestowed upon us to continue the ERIC for at least another 5 years. We are also happy to have been awarded new EU-funded projects. However, many challenges remain to maintain and further develop Euro-Argo's capabilities to implement OneArgo. The most pressing one will be to secure complementary EU funding to sustain this ambitious objective. As Euro-Argo's data is so essential for tracking some of the most pressing challenges of our time, climate change and the health of the ocean, there can be no doubt about my motivation. Enjoy reading!

Yann-Hervé De Roeck,
Director General

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A BGC float at the Ifremer facility, in the unique 20-metre depth pool tank where Argo floats are tested.

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Executive summary

2023 was an important year for Euro-Argo ERIC, with the launch of three new projects, a successful ESFRI monitoring and the publication of a new strategy for the next decade. Euro-Argo ERIC managed to deliver on all its service commitments and projects, in line with the five objectives of the 2019-2023 five-year plan, and is on track for the OneArgo global, full-depth and multidisciplinary design, targeted by the international Argo community by 2033.

EUROPEAN PROJECTS IN A NUTSHELL

- **2 projects ended in 2023:**
  ENVRI FAIR,
  EuroSea
- **3 new projects in 2023:**
  GEORGE,
  ERIC Forum 2,
  COINS SC3
- **2 projects to come in 2024 :**
  AMRIT,
  ENVRI Hub Next

EURO-ARGO MAIN OUTREACH ACHIEVEMENTS

- **3** videos about the ERIC's missions and organisation
- **1** presentation poster
- **95** scientific papers
- **1** comic to explain ocean observation to children
- **10** articles within the framework of the European Ocean Observation Awareness Campaign

7 FIGURES ABOUT THE EUROPEAN CONTRIBUTION TO ARGO IN 2023

235 floats deployed, reaching 36% of the global effort, including:
- **8** Deep floats
- **30** "full BGC floats" measuring all variables

33% of Euro-Argo floats deployed **carrying an oxygen sensor**

Almost **80%** of **data from Core floats (measuring temperature and salinity)** managed by European data centres are qualified with an accuracy allowing climate applications

© Dimitris Kassis

Pre-deployment testing of a Deep Arvor-I float in the Ionian Sea.

EURO-ARGO ERIC GOVERNANCE

© Ifremer

The Euro-Argo ERIC Office team in Brest.

New strategy published
The Euro-Argo strategic plan for the decade 2024-2033 was released: https://doi.org/10.5281/zenodo.10653294.

ESFRI monitoring approved Euro-Argo ERIC was monitored by the ESFRI which praised the performance of Euro-Argo as very sound and recommended the ERIC maintain its Landmark label.

STAG evaluation successful Euro-Argo ERIC successfully passed its second 5-year evaluation by its Scientific and Technology Advisory Group, which led to recommendations for the ERIC to progress on key identified topics in the years to come.

A 12th Member joined
Poland went from being a Euro-Argo ERIC Observer to a Member.

1 FIVE-YEAR PLAN OBJECTIVES

Over the past ten years, the Euro-Argo ERIC has demonstrated its ability to develop and manage the European contribution to the international Argo programme. Many activities and services have been implemented and need to be continued through the next phase of Argo.

See the full five-year plan on https://doi.org/10.13155/71936

The 2019-2023 five-year plan articulated five objectives against which its achievements were measured. The challenges were multiple:

- Maintain Core Argo activities;
- Further develop extensions towards the "Global, full-depth and multidisciplinary" OneArgo design ("On the Future of Argo: A Global, Full-Depth, Multi-Disciplinary Array", Roemich *et al.*, 2019) in a sustainable way;
- Continue engagement with existing and new end-users to meet societal needs.

Euro-Argo is not alone and must evolve within a landscape of complementary Research Infrastructures (RIs). The development of an integrated ocean observing system was pursued by various observation coordination bodies (GOOS at global level, AtlantOS and SOOS at basin levels, EOOS at European scale) in their respective strategies as a contribution to the UN Decade of Ocean Science for Sustainable Development. Euro-Argo must contribute to this landscape to complement the other observation networks as efficiently as possible.

To face these challenges, the five Euro-Argo 2019-2023 objectives were interconnected and many partners were involved → **Figure 1**.

This report describes the activities carried out by the Euro-Argo ERIC in 2023 with respect to these five objectives.

THE FIVE OBJECTIVES OF THE 2019-2023 FIVE-YEAR PLAN

Objective 1	Objective 2	Objective 3	Objective 4	Objective 5
Sustain the existing Core Argo mission.	**Develop the extension of Euro-Argo** contribution to Argo according to the Euro-Argo strategy as a contribution to the "Global, full-depth and multidisciplinary Argo" design.	**Develop scientific and technological coordination** with other ocean observing networks and contribute to a Global Ocean Observing System (GOOS) design and its European contribution through European Ocean Observing System (EOOS) initiative.	**Develop the engagement with European Argo user communities and stakeholders and reinforce Euro-Argo visibility.**	**Operate the Euro-Argo ERIC Office** under good governance.

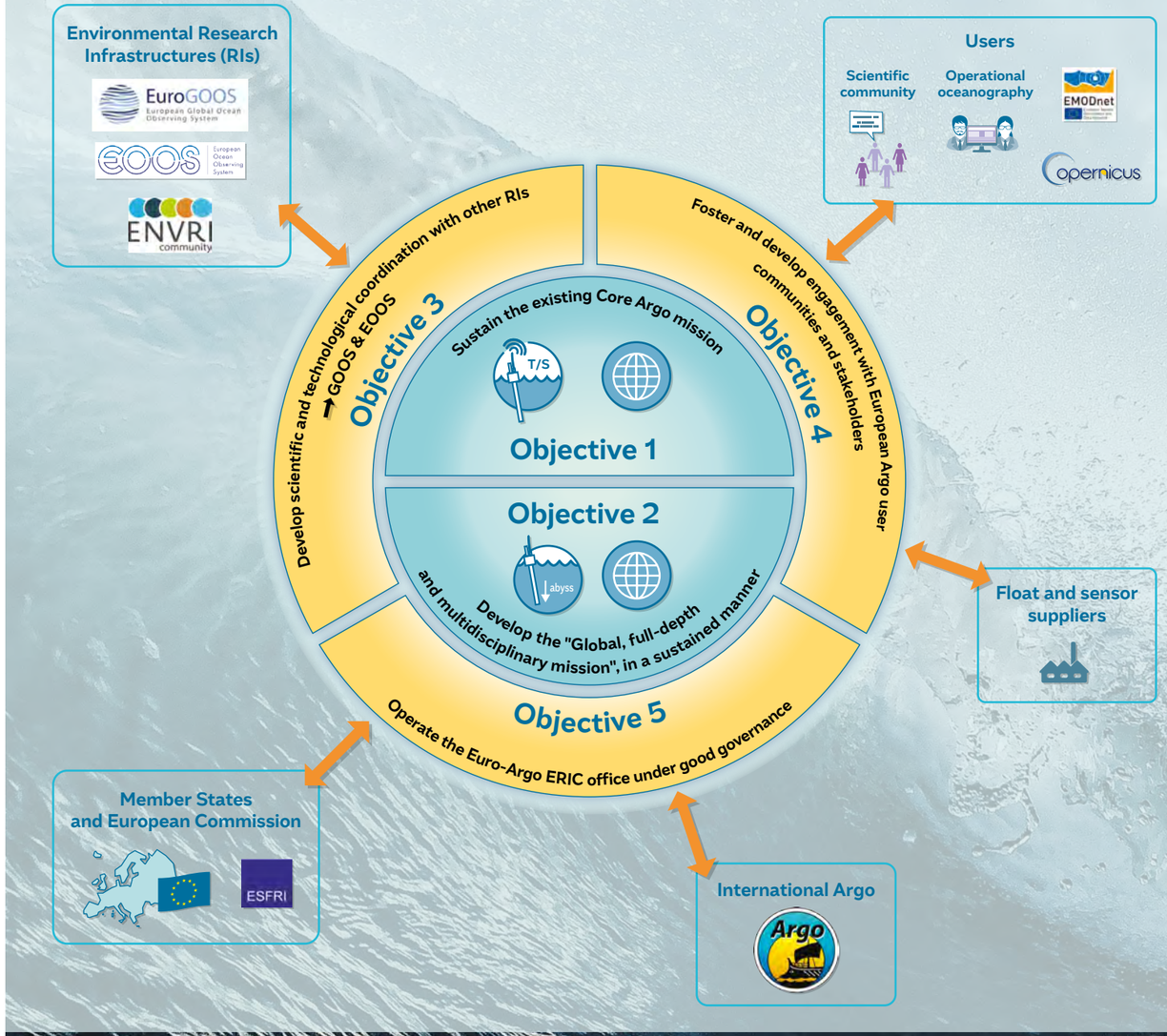


Figure 1: The five objectives of the five-year plan and partners involved.

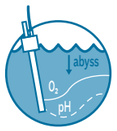
© Silas baisch/Unsplash

2 REVIEW OF 2023 ACTIVITIES

2023 was a milestone year for Euro-Argo ERIC with the end of the 2019-2023 five year plan and the launch of the Strategic Plan 2024-2033. It was also a year rich in sharing DMQC skills and experience, successful evaluations from ESFRI and STAG, and outreach thanks to many communication tools and events, such as the workshop co-organised by Euro-Argo during the European Maritime Day. Furthermore, the ERIC welcomed a new Member, Poland. Formely an Observer, Poland has a remarkable history with Euro-Argo, having already deployed 32 floats. 10 are still active, among which 7 are BGC floats.

Objective 1

Objective 2



SUSTAIN THE EXISTING CORE ARGO MISSION AND EXTEND THE EURO-ARGO CONTRIBUTION TO THE ONEARGO DESIGN

Network implementation

In 2023, according to declarative numbers on OceanOPS, 235 floats were deployed, including (only) 3 EU-funded floats and 232 funded by national Members. Table 1 below shows the distribution of floats per type of float, excluding 13 floats (235-13=222) with the status "registered" for which the information is missing (OceanOPS system being down). Regarding the 3 EU-funded floats, one Deep float funded under the EuroSea project was deployed in the Atlantic Ocean, one recovered and refitted MOCCA float (core) was deployed in the Baltic Sea and one BGC float (5 variables) was deployed in the Black Sea as part of the DOORS project.

In March 2024, about 85% of the floats deployed in 2023 were still active, some of the inactive ones being lost at deployment, other being presently under ice. In total (EU-funded + national floats), 19 European floats were recovered in 2023, mainly in marginal seas, but also 1 in the Southern Ocean and 2 in the Arctic Ocean. A new KPI was developed to follow the number and location of recovered floats through the years.

In 2023, Euro-Argo took part in "Deployment Planning meetings", organised internationally and across ocean observing networks, resulting in coordinated launches of Argo floats in the Atlantic and Indian Oceans. Euro-Argo also continued the implementation in its usual areas of interest (Nordic Seas and European Marginal Seas), but also in the Southern Ocean, the Arctic Ocean and, to a lesser extent, in the Pacific Ocean.

The European contribution to the Deep-Argo mission was lower than last year: 8 Deep floats were deployed in 2023 versus 15 in 2022. However, contribution to BGC-Argo increased, not only for oxygen (75 floats with an oxygen sensor, i.e. more than 33% of the floats deployed, versus 66 (~30%) in 2022) but also for all other parameters, except pH (small decrease due to sensor and sensor procurement issues) and nitrate (stable). 17 full-BGC floats (UK, Norway, France) were deployed in total in 2023. The experimentation on UVP and hyperspectral radiometry continued, with a growing number of floats equipped with these new sensors: 17 floats equipped with the UVP sensor (France, Norway, Italy) and 21 floats equipped with hyperspectral radiometry (France and Germany) were deployed in 2023.

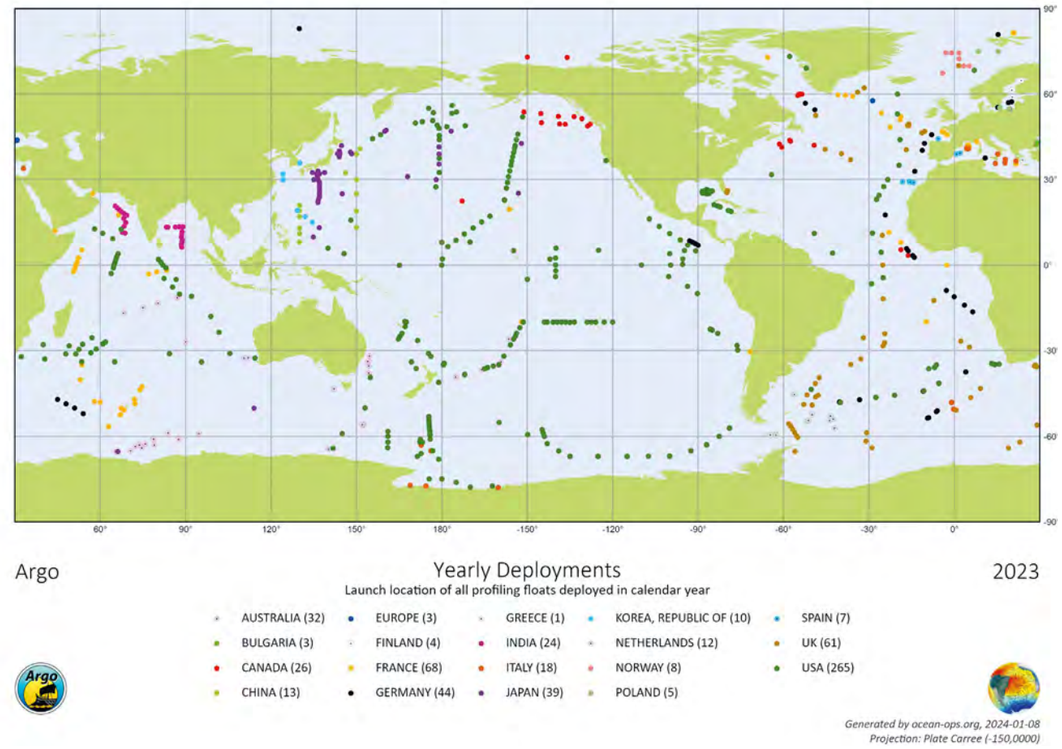


Figure 2: Launch locations of all Argo floats deployed in 2023. There were 234 Euro-Argo units among the 643 deployed in 2023, representing 36% of the deployments of the global effort. © OceanOPS/AIC

	Variables							Float types						
	T/S	O_2	Chl-a	BBP	NO_3	Irradiance	pH	Core	Core + O_2	2-3 var BGC	4-6 var BGC	Deep	Deep +O_2	Total (floats)
EU funded	3	2	1	1	1	1	0	1			1		1	**3**
Member states	119	73	48	48	19	45	24		16	5	47	1	6	**219**
Total	**222**	75	49	49	20	46	24	145	16	5	48	1	7	**222**

Table 1: European floats deployed in 2023, per parameter measured (orange, 7 first columns) and per type of float (blue, 6 last columns) following the AST classification.

© Arved Fuchs expedition

Deployment of a BGC float with the polar explorer/writer Arved Fuchs in the Baltic Sea.

© Heini Jalli FMI

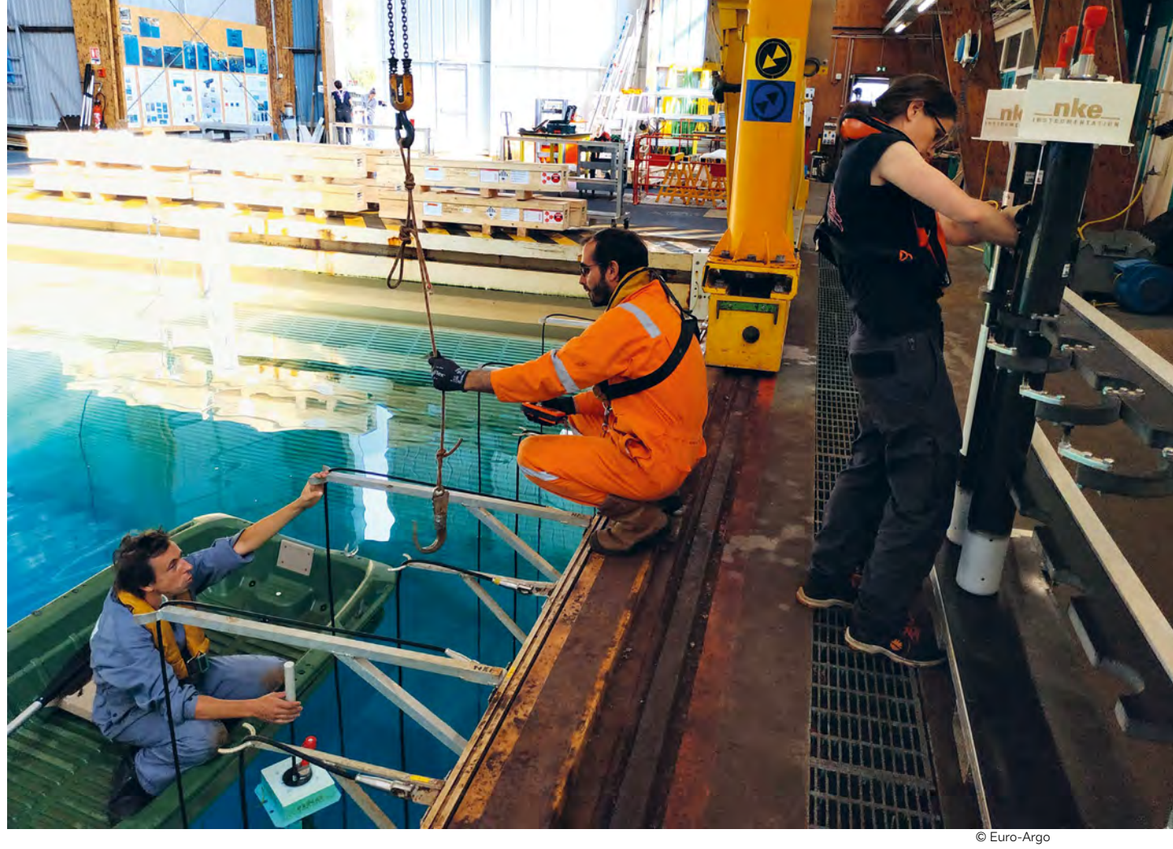
Recovering a float deployed during the EARISE project.

Float procurement

A framework for central procurement is set up for Euro-Argo ERIC and its partners, allowing it to provide floats for the three Argo missions (Core, Deep and BGC). Through complementary contributions to the ERIC operational budget paid by the Members, Euro-Argo Office is entrusted with the development and consolidation of the European component of OneArgo, while relying on these same Members to ensure the deployment and monitoring of a given number of floats.
For floats purchased through this service, the Euro-Argo Office technical team offers Members to handle the inbound logistics (follow-up of the manufacturing process, delivery dates, coordination of the telecommunication, contracts opening, etc.), to carry out the acceptance tests at Ifremer testing facilities (seawater basin for real profiling down to 20 metres, hyperbaric chamber for the Deep floats) and finally to ship the equipment either to the institutes or directly to the deployment vessels.

Data management

2023 was a year rich in sharing DMQC skills and experience, with 3 DMQC workshops organised. The first international BGC DMQC workshop was held in Villefranche-sur-Mer (France) in January during four days, covering the six official BGC-Argo variables and gathering about 50 participants from all over the world (half of them remotely). In April 2023, European partners organised a “Marginal Seas DMQC workshop” hosted by Poland in Sopot which lasted two days.



© Euro-Argo

Testing the Deep Argo CTS4 floats at the test basin in Brest.

The workshop, gathering about 20 people, covered general issues about Argo DMQC, the specificities of several marginal seas, the issue of reference datasets needed to perform DMQC and a practical session targeting the Baltic Sea. Discussions around Baltic Sea DMQC were continued in an additional session in Bergen (Norway) in October. Euro-Argo partners were involved in the organisation of an international Deep DMQC online workshop in June, in which 25 DMQC operators participated.

A major release of the tool that allows everyone to assess the DMQC status and statistics of a chosen set of floats was made available by Euro-Argo on the euroargo-dev sharing platform: **https://github.com/euroargodev/DMQC_status_and_statistics.**

Euro-Argo continued to maintain an international shared spreadsheet to monitor the floats affected by a lasting issue of Abrupt Salinity Drift (ASD) in collaboration with all international DMQC operators and presented the status of the issue both at the AST24 (March) and at the ADMT24 (October) meetings. The issue seems to be solved but as the subset of the fleet carrying potentially impacted sensors is still young, it will continue to be closely monitored for a few years. Euro-Argo was instrumental in reaching a global compensation agreement with the supplier of the affected sensor.
Discussions on the organisation of BGC DMQC at Euro-Argo level were pursued, with various scenarios investigated. The preferred scenario between Euro-Argo Members is hybrid between a fully centralised organisation and a fully distributed organisation and discussions will continue in 2024 to decide how to progress in the chosen direction.
Two new KPIs were defined regarding the data management: the effort on the delayed mode processing for Core and BGC variables in terms of number of floats reviewed in delayed mode each year

© Kamila Walicka/BODC

Participants at the BGC DMQC workshop in Villefranche-sur-Mer in January.

(year of update of profile files) and the overall availability and quality of the dataset in terms of observations: number of profiles available by profile year, number of delayed-mode profiles, number of bad and probably bad profiles, number and rate of bad profiles (confirmed in delayed mode).

Technical developments

Ifremer developed a Deep-Arvor profiling float equipped with two oxygen sensors (Aanderaa 4330 and Rinko AROD-FT) for *in situ* comparison purposes. The development of a new Deep Arvor capable of profiling up to 6000 m continued and first deployments are expected for 2025 in the frame of the Piano and Argo-2030 projects.

IOW continued the pilot deployments of a novel pCO2 sensor on a float in the Baltic Sea **(see page 36)**.

In the GEORGE project **(see page 42)**, efforts were initiated to enhance and fasten the integration of new sensors and software into BGC CTS5 Argo floats. This included developing a Linux kernel, which involved hardware selection, studying and validating programming structures using Python. Additionally, work began on integrating an acoustic sensor onto BGC Argo floats for wind speed measurements at the free surface during the drifting phase at 1000 m depth, as an important parameter enabling CO_2 flux calculations. This process entailed defining technical requirements and selecting a supplier.

2023 Float Orders (on behalf of Members)

COUNTRY/INSTITUTE	Number of floats ordered by ERIC Office (Centralised Procurement)					
	Total	Core	Core + DO	DEEP + DO	BGC 6 variables	BGC (< 6 variables)
BULGARIA/IO-BAS	3	1	2			
IRELAND/MI	6	6				
ITALY/OGS	27	1	24	2		
NETHERLANDS/KNMI	6	6				
NORWAY/IMR	5	5				
POLAND/IOPAN	7		6			1
TOTAL	54	19	32	2	0	1

Table 2: ERIC float procurement in 2023 (by country and float type), on behalf of Euro-Argo Members.

© Daniel Rak

Deployment of a BGC Argo float in the Baltic Sea .

Euro-Argo Key Performance Indicators (KPIs)

→ Number of European float deployments

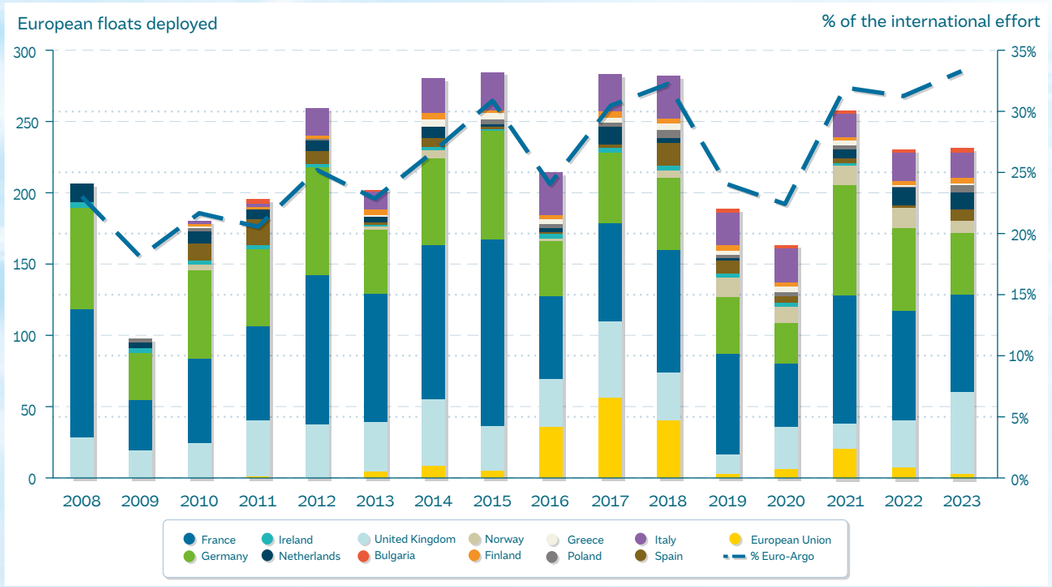


Figure 3: Evolution of Euro-Argo deployments in number of floats (colors, left axis) and as a percentage of the international effort (blue dashed line, right axis). © OceanOPS/AIC

→ Number of Euro-Argo operational floats (active at given time)

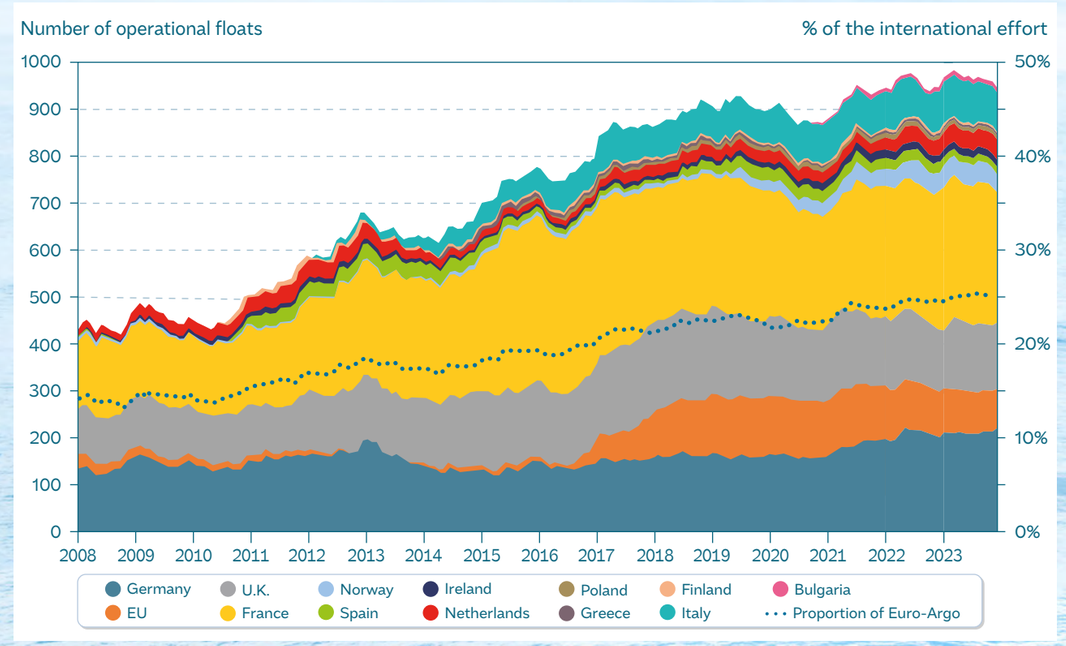


Figure 4: Evolution of the European contribution to the Argo network in number of operational floats (colour, left axis) and in percentage of the international effort (blue dashed line, right axis). © OceanOPS/AIC

→ Number of Euro-Argo operational floats for each of the three missions of OneArgo (Core, BGC and Deep)

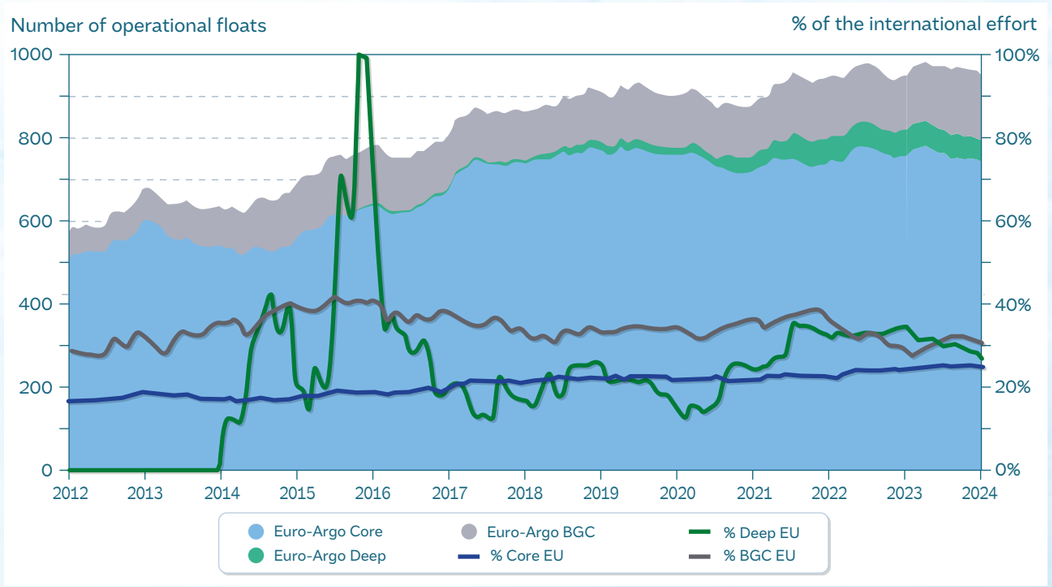


Figure 5: Evolution of the Core, BGC and Deep missions, in number of operational floats (colour, left axis) and in percentage of the international effort (blue, grey and green lines, right axis). © OceanOPS/AIC

→ Number of Euro-Argo operational floats measuring a given variable

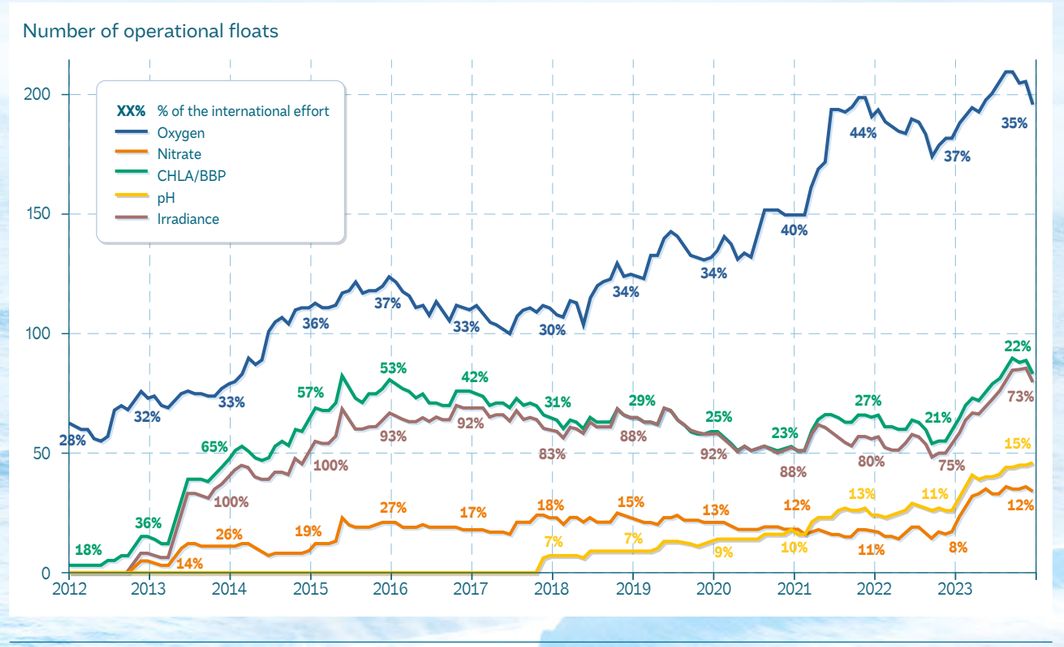


Figure 6: Evolution of the European contribution to four of the six BGC parameters, in number of active Euro-Argo floats measuring that variable (left axis, solid curve), and percentage of active Euro-Argo floats measuring that variable in the global array (percentage of each year on the curves). © OceanOPS/AIC

→ Number of floats per manufacturer

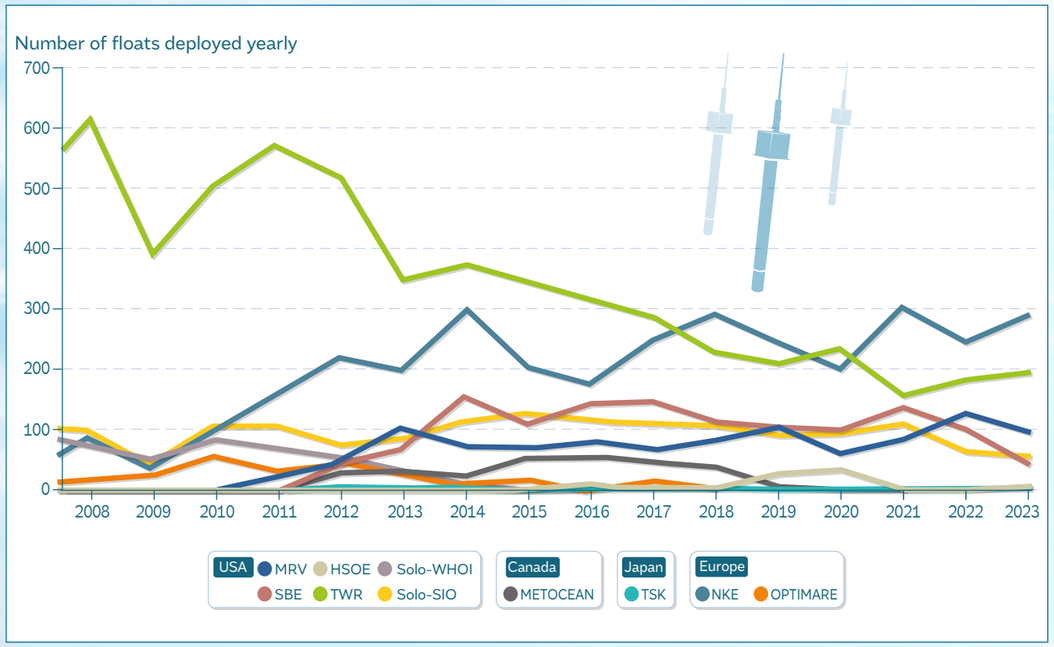


Figure 7: Evolution of the number of floats deployed per year, grouped by float manufacturer. © OceanOPS/AIC

→ Number of recovered floats

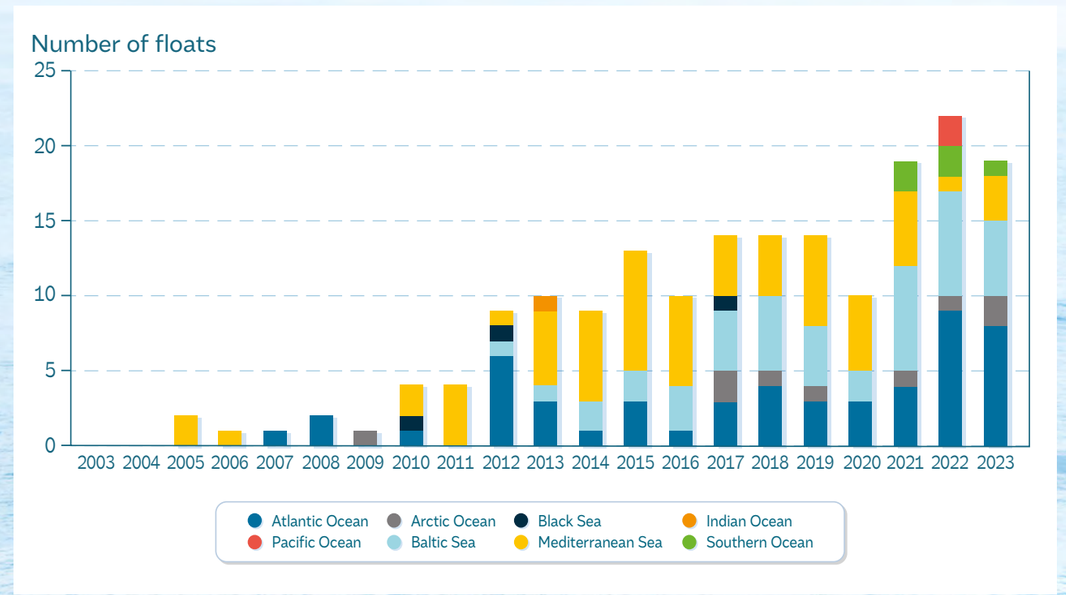


Figure 8: Evolution of the number of recovered floats by year of recovery and by recovery basin (In blue for the Atlantic Ocean, yellow for the Mediterranean Sea, grey for the Arctic Ocean, green for the Indian Ocean, light green for the Baltic Sea, dark blue for the Southern Ocean, black for the Black Sea and dark orange for the Pacific Ocean). © Ifremer/GDAC

→ Number of floats processed in delayed mode

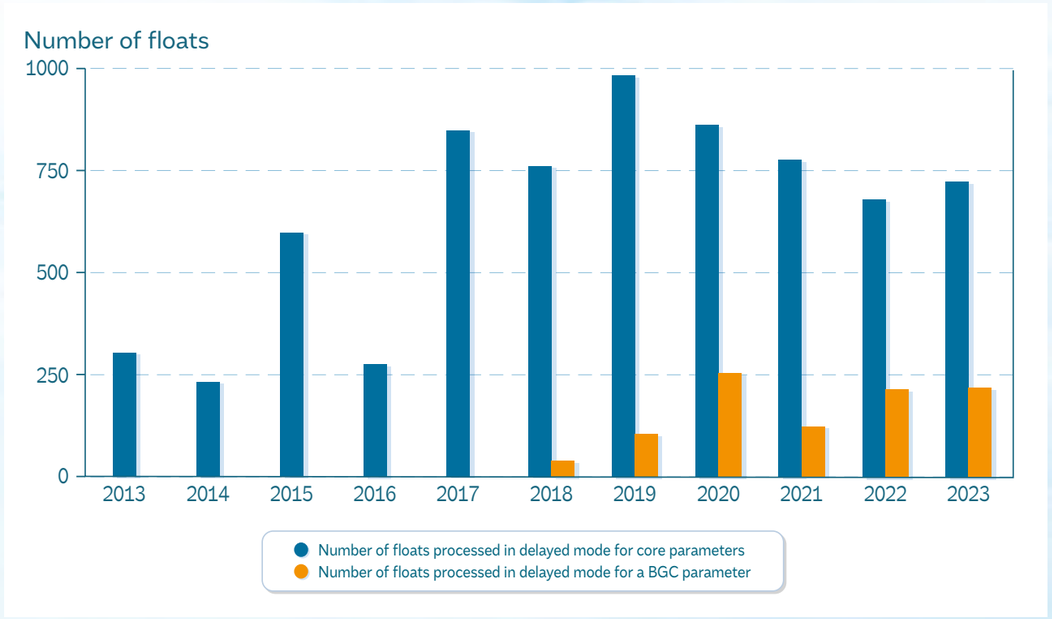


Figure 9: Evolution of the number of floats processed in delayed mode, for core parameters (in blue) and for BGC parameters (in green). The x-axis corresponds to the year when the delayed mode processing was performed. For BGC, the time series begins in 2018 because the BGC index creation, used in the computation of this KPI, has started in 2018. © Euro-Argo/GDAC

→ Number of available profiles collected by Euro-Argo floats

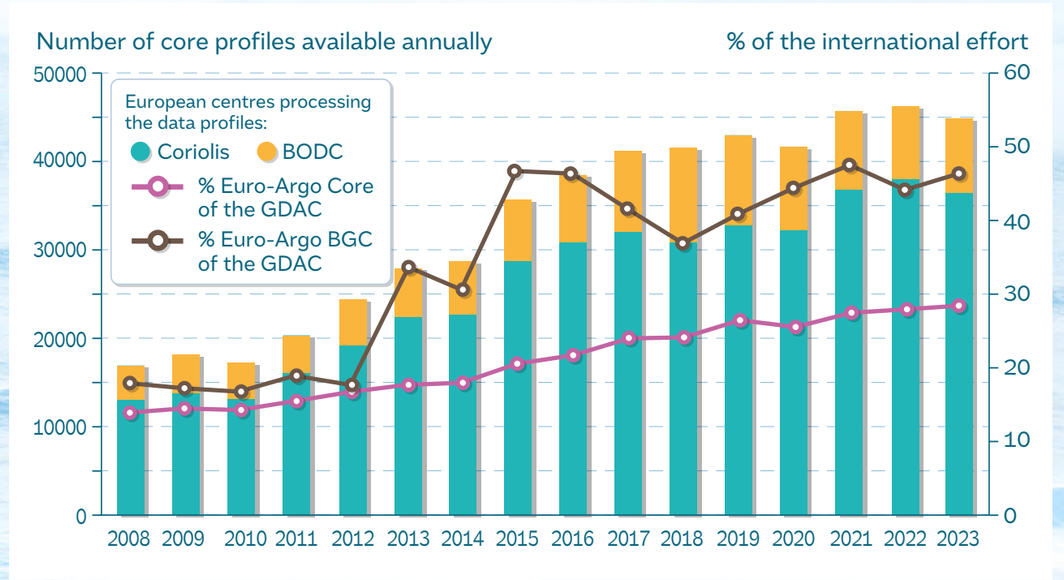


Figure 10: Argo data profiles processed by Coriolis and BODC DACs per year: in number of profiles (left axis, blue: Coriolis and orange: BODC) and in percentage of the total number of profiles available on the GDAC (right axis). © Ifremer/GDAC

→ Number of users and data access

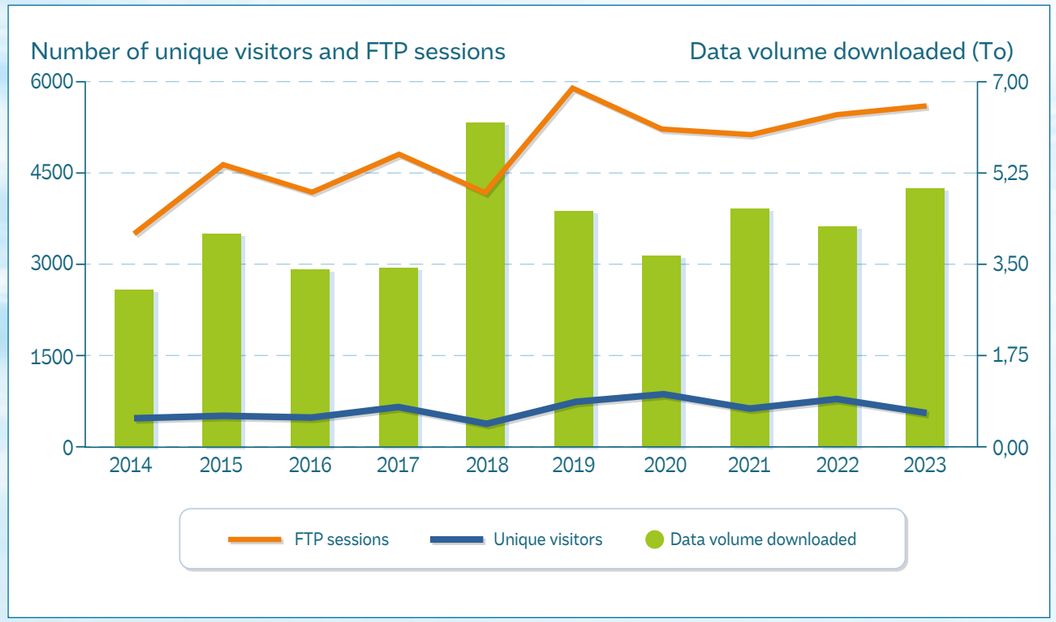


Figure 11: Evolution of the Argo data access through the average number of visitors per month, the number of sessions per year and the volume of data files downloaded per year. © OceanOPS/AIC

→ Number of publications

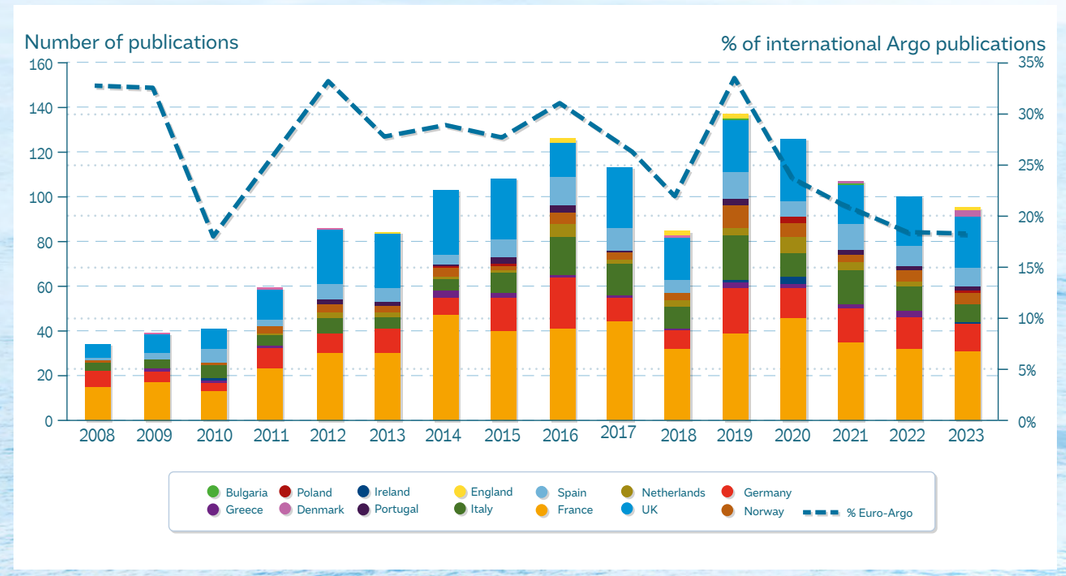


Figure 12: Euro-Argo publications per year (defined as publications sing Argo data with first authors' affiliation in a European country) in number of publications (left axis) and in percentage of the international Argo publications (right axis). © Ifremer/GDAC

→ Number of salinity profiles and their quality

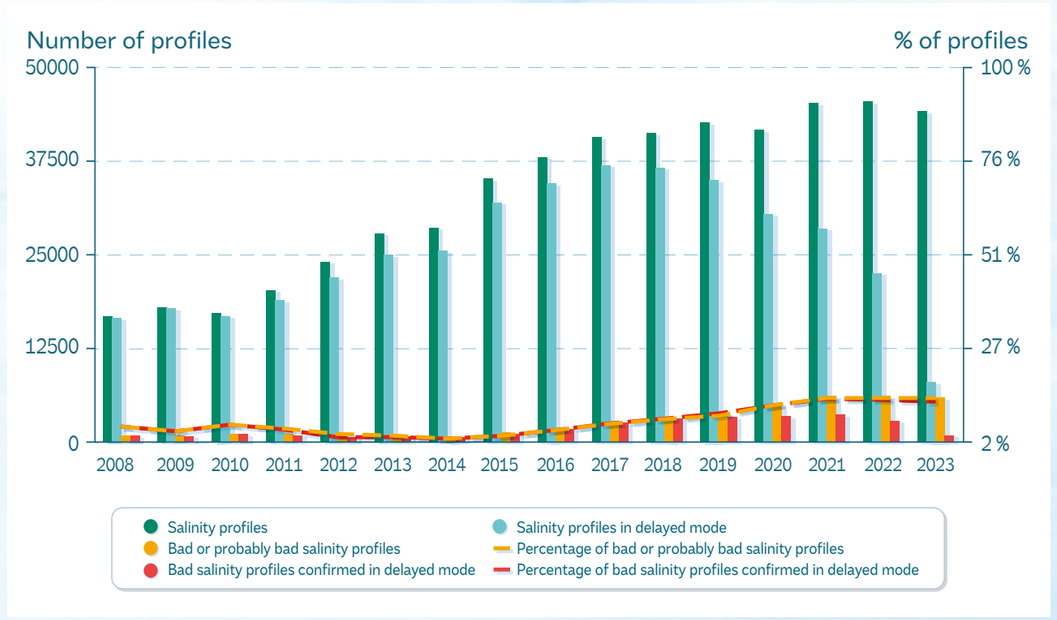


Figure 13: Evolution of the status of availability (dark green and light green) and overall quality (orange and red) of the salinity profiles by year of profile observation. Total number of salinity profiles (either in real time or in delayed mode) are in dark green bars. Number of salinity profiles processed in delayed mode are in light green. Total number of probably bad or bad (in real time or in delayed mode) are in orange, and confirmed bad salinity profiles are in red. The corresponding percentage with respect to the total number of profiles (orange) and total number of delayed mode profiles (red) are in dashed lines. © Euro-Argo/GDAC

Group picture at the 24th Argo Steering Team (AST24) meeting in Halifax, Canada in March.

Objective 3

CONTRIBUTE TO A GLOBAL OCEAN OBSERVING SYSTEM

In 2023, Euro-Argo pursued its collaborations with other Marine RIs through activities within ongoing EU projects (EuroSea, ENVRI-FAIR, DOORS, FAIR-EASE, GEORGE) and beyond. The Office and some Euro-Argo partners were also highly involved in setting up proposals answering EU calls dedicated to collaboration between Research Infrastructures. In particular, the AMRIT proposal was built on the outcomes of the Marine RIs workshop organised in 2021 by Euro-Argo, in collaboration with 10 other Marine RIs (side event of the 9th EuroGOOS Conference) and following discussions held during the "Deep and BGC Argo workshop" organised within EuroSea. The project has been granted and will allow most of the European Marine RIs involved in ocean observing to move one step further in the implementation of the European Ocean Observing System (EOOS) together with OceanOPS and EuroGOOS.

On an international level, Euro-Argo participated in May in the "Towards Global Earth Observatory" workshop, organised by the World Meteorological Organization (WMO) and the Atmosphere and Climate Competence Center (ACCC) near Helsinki. The main European Environmental RIs discussed how to work together towards a Global Earth Observatory research infrastructure, in preparation of the observation component of the EVE (Earth Virtualization Engine) Summit (July 2023, Berlin).

European teams contributed to the annual AST and ADMT meetings, held respectively in Halifax, Canada in March and in Hobart, Australia in October. Euro-Argo also co-organised with international colleagues an online workshop in September to discuss with the Fishing Vessel Observing Network (FVON) community. The workshop was an opportunity to present the Argo data system and share best practices with the FVON community to help them in setting up their own data system.

Objective 4

DEVELOP ENGAGEMENT WITH THE EUROPEAN ARGO USER COMMUNITIES & STAKEHOLDERS AND REINFORCE EURO-ARGO VISIBILITY

Major events

In March, GEORGE, a new HORIZON-funded project, kicked off. This 4.5-year project aims to improve marine observations in terms of quality, coverage and continuity, through developing novel technologies, particularly autonomous sensors and platform improvements. The new technologies will enable more systematic autonomous *in situ* seawater CO_2 system characterisation, and CO_2 fluxes on moving and fixed platforms. GEORGE brings together 28 leading partners from academia and industry alike, including three research infrastructures: EMSO ERIC, Euro-Argo ERIC and ICOS ERIC. Together, these three ERICs cover European marine waters from coasts to open ocean and from the seabed to the ocean interior and the surface ocean.

During the European Maritime Day (EMD2023) in May, a workshop entitled "Sustainable ocean observation, from open sea to coast: shared responsibilities" was co-organised with EuroFleetPlus, EuroGOOS and Ifremer on Euro-Argo's initiative. This very successful workshop – which reached near capacity – was followed by a constructive question and answer session on how ocean observation stakeholders are consolidating their efforts to promote the long-term coordination and sustainability of ocean observation. To achieve a concrete outcome from the fruitful discussions, the organisers shared a statement on the key role of *in situ* marine data collection in Ocean Observation, and invited participants to contribute their views through a shared online survey and a collaborative document. This collaborative statement was approved by the attendees.

In June, Euro-Argo attended the Lund conference organised by the Swedish Presidency of the European Council. On the closing day was presented the Lund Declaration on maximizing the bene-

Estérine Evrard and Marine Bollard of the Euro-Argo ERIC Office at the EMD2023 in May.

© Euro-Argo ERIC

fits of research data. According to the declaration, the EU needs to make better secondary use of data to improve its research and innovation performance. Importantly, the Swedish government warned that research outputs are still not readily available for reuse, leading to less efficient use of resources, as "implementation and harmonisation of FAIR and open research data policies is slow and uneven across Europe," and calls for "new reward models for research data producers", among others.

About 200 stakeholders met for the EuroSea Final General Assembly in September. As part of EuroSea, 53 partners from 14 European countries as well as Brazil and Canada worked together to improve the European system for ocean observing and forecasting in a global context. In doing so, they provided an important basis for meeting the growing demand for information supporting social and political processes and decisions. During the presentation of the WP3 – Network Integration and Improvement – achievements, Claire Gourcuff, Euro-Argo ERIC Science Officer, described the new strategy for Deep Argo and BGC Argo components, whose definition has been supported by EuroSea. In addition, she highlighted the need to refine the European strategy for OneArgo implementation, starting from this new Deep & BGC strategy, considering European specific needs (including specific requirements for high latitudes and Marginal Seas) and better integrating operational services needs in collaboration with them (CMEMS, ECMWF in particular). As a concrete outcome of the EuroSea Symposium organised as part of the General Assembly, the EuroSea Declaration, a commitment to advancing ocean observing and forecasting, was officially published.

In October, EuroGOOS held its 10th International Conference in Ireland. It brought together over 160 participants and covered all aspects of operational oceanography and its societal relevance. Four high-level plenary sessions were dedicated to the UN Ocean Decade, Digital Twin Ocean, European Ocean Observing System (EOOS), and Future of Operational Oceanography. The final results of the Euro-Argo RISE H2020 EU project were presented, as well as the new strategy for Deep and BGC Argo in Europe developed within EuroSea.

Events	Dates (2023)
BGC Argo DMQC workshop	January 23rd - 26th
ENVRI week	January 30th - February 03rd
GEORGE Kick Off Meeting	March 15th - 16th
AST-24	March 20th - 24th
Marginal seas DMQC workshop	April 18th - 19th
Towards Global Earth Observatory workshop	May 8th - 10th
European Maritime Day (EMD)	May 24th - 25th
Copernicus Marine 7th General Assembly	June 5th - 6th
Deep-Argo DMQC Workshop	June 5th - 6th
Lund Conference and the ENVRI-FAIR Policy event	June 19th - 20th
EuroSea/OceanPredict workshop	July 11th
Mercator Ocean International workshop	September 14th - 15th
EuroSea Final General Assembly	September 19th - 21st
High-level conference on Research Infrastructures and 2nd ESFRI Stakeholder Forum Meetup	September 25th - 27th
10th EuroGOOS Conference	October 3rd - 5th
WMO Greenhouse Gas Workshop	October 3rd - 5th
Ocean reanalyses workshop CMEMS	October 10th - 12th
ADMT-24	October 23rd - 27th
International Digital Twins of the Ocean Summit 2023	November 9th - 12th
ERICs in EOSC: Discussing the EOSC and EU Node concept	November 17th
Ocean Observation initiative: Meeting with DG MARE	December 07th
ESFRI Information Workshop for Landmarks	December 07th

Table 3: Events in 2023. The events organised by Euro-Argo Members are in blue (*when co-organised with Argo international) and the ones attended by Euro-Argo Office are in grey (dark grey: with a specific talk, presentation or training; light grey: attended as guests)

© Michael Rea

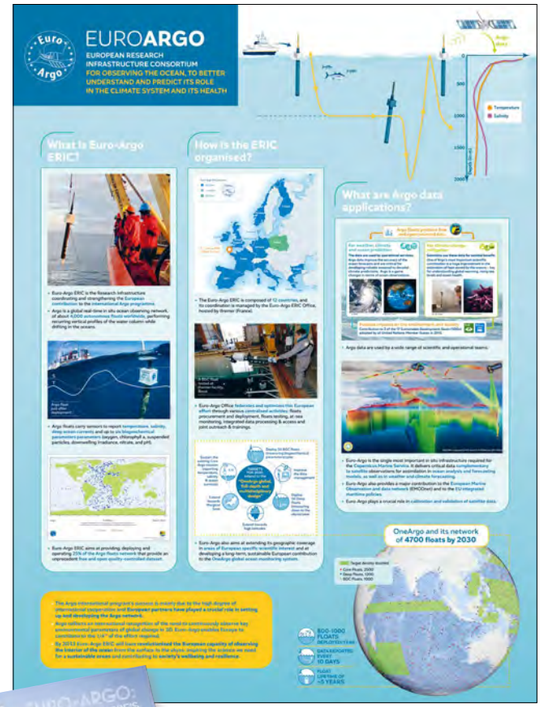
Participants at the EuroGOOS 10th International Conference in October.

Communication plan and tools

Increasing Euro-Argo visibility was done this year through the publication of 15 news items on the website and several new communication supports. In addition to this, the strategic plan for the decade 2024-2033 was released.

→ Euro-Argo presentation poster

A new poster was made to update the Euro-Argo presentation following the implementation of the OneArgo programme. It explains what Euro-Argo ERIC is, how it is organised, what the Argo data is used for and the goals of the OneArgo programme. A brochure will be made in 2024, with similar content, to be handed out at events attended by Euro-Argo Members.



→ "Euro-Argo: Boosting Europe's ability to monitor the ocean" brochure

This brochure was published as part of the European Ocean Observation Awareness Campaign launched by Mercator Ocean International and EU4OceanObs. The aim is to show how the European Union is responding to the global need for data on the oceans and coastal areas, with a particular focus on the EU's contribution to *in situ* ocean observation. The brochure consists of 10 articles in which many European scientists are interviewed. It is accompanied by 3 videos which were released in 2022.

→ "Journey with Ocean Observers" comic

Developed by Euro-Argo ERIC and OceanOPS, this comic invites readers aged 10 and over to learn more about the thousands of instruments at sea that take the pulse of the ocean to help understand climate change, monitor ocean health, and support weather predictions and early warnings for hazards and extreme events.

→ Ocean Observers improved website and content

Euro-Argo continued its activities with the Ocean Observers community, initiated in collaboration with OceanOPS in 2017. Under the EuroSea project, the Ocean Observers website underwent a comprehensive overhaul to enhance user experience, supervised by a specialised scientific editor, OceanOPS and Euro-Argo ERIC. Among the improvements, 12 new educational resources were added, together with scientific quizzes and games, and navigation was enhanced through keywords and cross-links to create pedagogical pathways among the resources.

→ 3 videos to present Euro-Argo ERIC missions

Three videos were produced for the Euro-Argo ERIC monitoring by ESFRI. The first one explains Euro-Argo's scientific missions, the second gives a virtual tour of the ERIC's organisation and activities and the third one shows the variety of events and training sessions organised by the team.

© Euro-Argo ERIC

Signing in Poland as a new Member during the 20th Council in Trieste in June.

Objective 5

OPERATE THE EURO-ARGO ERIC OFFICE UNDER GOOD GOVERNANCE

Council decisions

At the June 2023 Council meeting, Poland, which was one of the founding Observers of the ERIC, was accepted as a full Member. Poland is the twelfth Member of the ERIC. Furthermore, the National Institute of Aquatic Resources of the Technical University of Denmark formally applied for Candidate Membership. The institute is now seeking to gain endorsement by the Danish government and file an application for Membership or Observership.

On November 10th 2023, the Euro-Argo ERIC Council adopted a revised version of the ERIC statutes presented, after consulting with the Management Board, by the Director General. At its creation, it had been established that only the central infrastructure – the Office hosted by Ifremer in Plouzané, France – would constitute the ERIC. This had led Euro-Argo ERIC to be formally considered as a centralized infrastructure. The revised statutes now enlarge the perimeter of the ERIC to all participating entities and, thereby, ratify the very nature of Euro-Argo ERIC as a distributed infrastructure. Other, non-essential changes to the statutes are aimed at improving the overall description and management of the infrastructure.

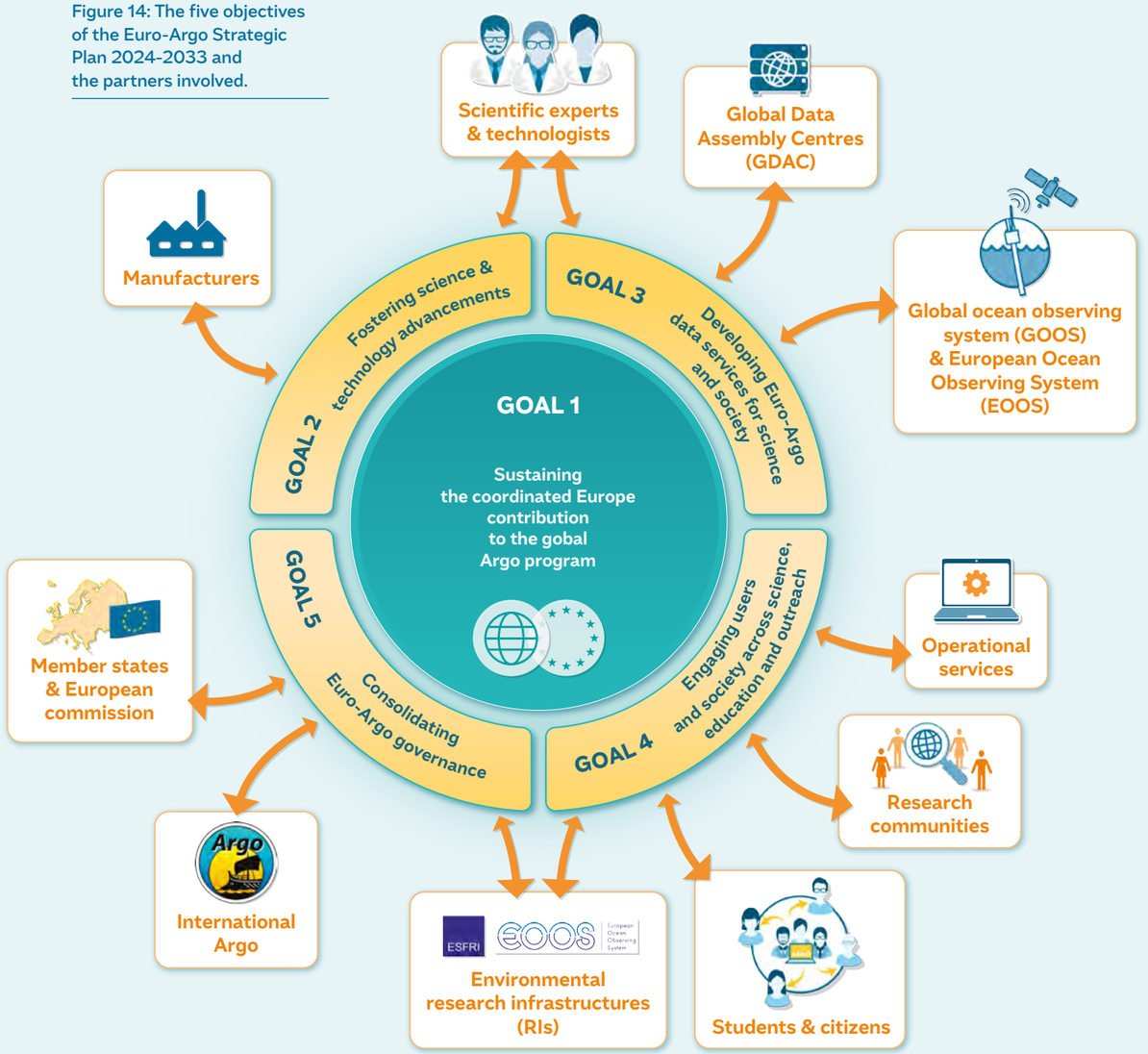
Strategic Plan 2024-2033 & Implementation Plan 2024-2028

In November 2023, the Council formally adopted the Euro-Argo Strategic Plan 2024-2033. The plan, which is a joint undertaking of the Management Board and the Office, is conceived to develop a long-term, sustainable European contribution to the OneArgo global ocean monitoring system, reaching one fourth of the fleet, in order to better understand and predict the ocean, its role in the climate system and its health. It includes five goals broken down in a series of actionable objectives:

- GOAL 1. Sustaining the coordinated European contribution to the global Argo programme
- GOAL 2. Fostering science & technology advancements
- GOAL 3. Developing Euro-Argo data services for science & society
- GOAL 4. Engaging users & society across science, education and outreach
- GOAL 5. Consolidating Euro-Argo governance

The Implementation Plan 2024-2028 was designed according to the Strategic Plan. In compliance with the renewed statutes, it is meant to be applied in full synergy between the Office and the distributed nodes. It defines priority actions and the resources needed to achieve the objectives, as well as the indicators against which progress and success will be measured.

Figure 14: The five objectives of the Euro-Argo Strategic Plan 2024-2033 and the partners involved.



Monitoring, evaluation and consultations

2023 was a very busy year with respect to evaluations and consultations. Euro-Argo ERIC was monitored by the European Strategy Forum on Research Infrastructures (ESFRI) as one of the so-called ESFRI Landmarks. ESFRI Landmarks were indeed introduced in the ESFRI Roadmap 2016 as reference research infrastructures and are pillars in the European Research Area (ERA) landscape. Guaranteeing the excellence of the Landmark label, ESFRI is responsible for monitoring the quality of the RIs listed in the ESFRI roadmap as Landmarks. The objectives of the monitoring were to:

© BSH

Group photo at the 26th Management Board in Hamburg, Germany in May.

- enable regular exchanges between ESFRI and Landmarks on their long-term development;
- assess the quality of each individual Landmark;
- identify possible problems and support the Landmarks to take appropriate actions;
- gather information on the performance, outputs and impacts of the Landmarks.

The monitoring process included answering questionnaires, the provision of relevant documents, a virtual tour of the ERIC and an interview by the monitoring panel. In its final report, the panel praised the performance of Euro-Argo as very sound and recommended that Euro-Argo ERIC maintain its Landmark label. Further, the panel provided seven suggestions that could help to strengthen Euro-Argo in terms of scientific capabilities, visibility and recognition.

Euro-Argo ERIC also responded to several ESFRI questionnaires regarding the impact assessment of research infrastructures, the ESFRI landscape analysis, and access to research infrastructures, as well as an ESFRI financial survey. This financial survey aimed to identify the various sources of funding of the ERIC at European, national and regional levels, as well as the running costs and direct or in-kind investments, and to analyse the mid to long term financial perspectives. This very challenging exercise proved to be very useful in the strategic context of the implementation of the full OneArgo design by 2030. Euro-Argo ERIC also responded to an EC stakeholders' survey on "reporting obligations for ocean observation". In essence, this should consolidate Euro-Argo's reputation as an operational ocean monitoring tool.

Finally, in November 2023, the five-year evaluation by the STAG took place. The Scientific and Technical Advisory Group (STAG), which consists of independent experts, is established to advise the Council on any scientific or technical matters (including data management and instrumentation) relevant to the operation, development and evolution of the Euro-Argo ERIC as well as on access to data by research and operational users. Beside the evaluation per se, the STAG reviewed and fully endorsed the Euro-Argo Strategic Plan 2024-2033 and provided a list of recommendations to achieve its objectives.

Event	Date
25th Management Board	Feb. 16, 2023 (on line)
19th Council	April 26th, 2023 (on line)
26th Management Board	May 4-5, 2023 (Hamburg)
20th Council	June 8-9, 2023 (Trieste)
27th Management Board	June 16, 2023 (on line)
28th Management Board	Sept. 4-5, 2023 (Hamburg)
29th Management Board	Oct. 20th, 2023 (on line)
21st Council	Nov 9-10, 2023 (Paris)

Table 4: Euro-Argo Management and Council meetings in 2023.

3 EURO-ARGO MEMBERS MAIN ACHIEVEMENTS IN 2023

ARGO BULGARIA

- Deployed two ARVOR floats equipped with an oxygen sensor during R/V Akademik cruise
- Deployed two BGC floats in the frame of the H2020 DOORS project during R/V Mare Nigrum cruise
- Got involved in various ocean literacy events and presented BulArgo activities to the students from the Black Sea countries and beyond
- Reached its highest number of operational floats: 9

© IO-BAS

ARGO GERMANY

- ICBM deployed two APEX BGC Argo floats with polar explorer and writer Arved Fuchs in the Baltic Sea
- IOW continued the pilot deployments of a novel pCO2 sensor on a float in the Baltic
- BSH deployed two floats from RV Polarstern in the Arctic in the Amundsen Basin and AWI deployed four bottom grounded floats near the continental shelf of Antarctica
- Argo Germany held its users meeting on June 20th


© Arved Fuchs expedition

ARGO GREECE

- Deployed two Argo floats in the Greek seas under the framework of the Greek-Argo RI activities and the Euro-Argo ERIC cooperation activities. One float was Arvor-I type purchased by Argo Greece and deployed in the South Aegean during the Greek WFD network maintenance. The other was an Italian float, Deep Arvor-I, deployed during the MSFD winter cruise on behalf of Argo Italy.


© Dimitris Kassis

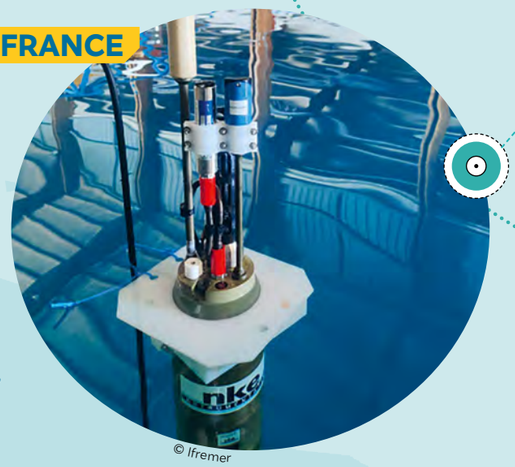
ARGO FINLAND

- Continued Baltic Sea monitoring with Argo floats with 4 new deployments
- Recovered Bothnian Bay float after successful measurements under ice
- Presented Baltic Sea Argo in R/V Aranda's open doors

© FMI/Kimmo Tikka

ARGO FRANCE

- Deployed 68 floats (37 T/S Core, 3 T/S/O2, 24 BGC, 4 DEEP)
- Participated in the international working group monitoring the problem of abrupt salinity drift (ASD) and contributed to a paper that improved understanding of the treatment and uncertainty of Argo salinity data (Wong *et al.*, 2023: **https://doi.org/10.5194/essd-15-383-2023**)
- Co-chaired, with the USA, the SCOR working group on 4D-BGC products (WG #168). The WG comprises 19 other Members, representing 14 different countries
- Co-authored the Deep-Argo implementation paper (Zilberman *et al.*, 2023,: **https://doi.org/10.3389/fmars.2023.1287867**)
- Developed a Deep-Arvor profiling float, equipped with two oxygen sensors (Aanderaa 4330 and Rinko AROD-FT), for *in situ* comparison purposes


© Ifremer

ARGO IRELAND

- Procured 6 RBR ARVOR floats via Euro-Argo ERIC
- Collaborated on outreach with Galway Atlantaquaria & SmartBay for STEPS Engineers Week & EMD
- Fostered collaborations at Oceans 2023 & 10th EuroGOOS International Conference
- Developed new promotional material for conferences and events and was featured in Research Infrastructures Calendar May'23

© Argo Ireland

ARGO ITALY

- OGS deployed 17 floats and CNR-ISMAR 1 float: 3 out of 18 were BGC Argo, 4 were equipped with the DO sensor, 2 were Deep Argo and 9 were Core Argo
- Performed measurements in the Ross Ice Shelf which provided the first-ever year round observations of water column changes in crucial areas, such as the polynya
- Deployed BGC floats during the BioSWOT-MED cruise designed to study the bio-physical coupling in the region of the North Balearic Front in the Western Mediterranean Sea, an area of moderate fine scale energy level
- Gave a lesson on Argo floats for students attending the MARBLE Project in marine robotics and approached local schools during the Trieste Next event to start the Adopt-a-Float program
- Published several papers including **https://doi.org/10.1038/s41598-023-29942-w** and **https://doi.org/10.3389/fmars.2023.1271638**


© CNR-ISMAR

ARGO POLAND

- Deployed two floats equipped with DO sensors in the Nordic Seas
- Deployed two floats equipped with DO sensors in the Southern Baltic Sea
- Deployed one 4-parameter BGC float in the Southern Baltic Sea (Gdansk Deep).
- Implemented Baltic floats for permanent monitoring of the Bornholm Basin and the Gdansk Deep
- Obtained valuable time series of oceanographic data from a limited area using the bottom parking method and high (1-2 days) profiling frequency
- Led a pioneering experience using an Argo float in the fjords of West Spitsberg


© Daniel Rak

ARGO SPAIN

- Reached a number of 19 operational floats
- Processed 2 Core Argo floats in delayed mode quality control
- Recovered 2 floats in the Western Mediterranean Sea and 1 in the Cantabric Sea
- Deployed 2 floats in the Western Mediterranean Sea and 6 in the Atlantic Ocean (one of them was the very first BGC float launched by Argo Spain)
- Published a paper titled “Analysis of global maritime traffic for the viability of a structural recovery program for Argo floats” in a high-impact journal (**https://doi.org/10.3389/fmars.2023.1161580**)


© SOCIB

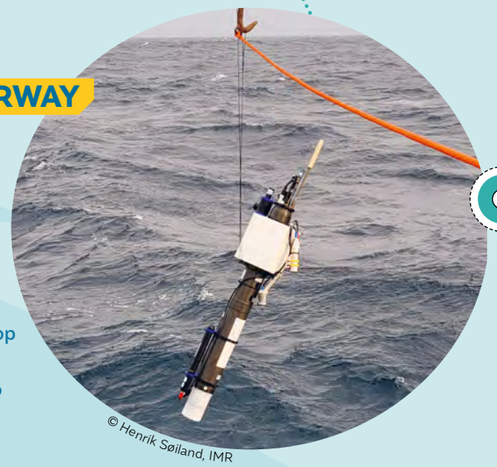
ARGO NETHERLANDS

- Bought and deployed six floats in the subpolar South Atlantic Ocean


© Sjoerd Groeskamp

ARGO NORWAY

- Deployed 8 floats in the Nordic Seas including 4 BGC floats and 2 floats which were equipped with a transmissometer and a UVP6-sensor
- Successfully recovered 1 BGC and 1 Deep float in the Nordic Seas
- Held a national Argo BGC workshop with almost 30 participants
- Improved the operational NorArgo website with new features


© Henrik Søiland, IMR

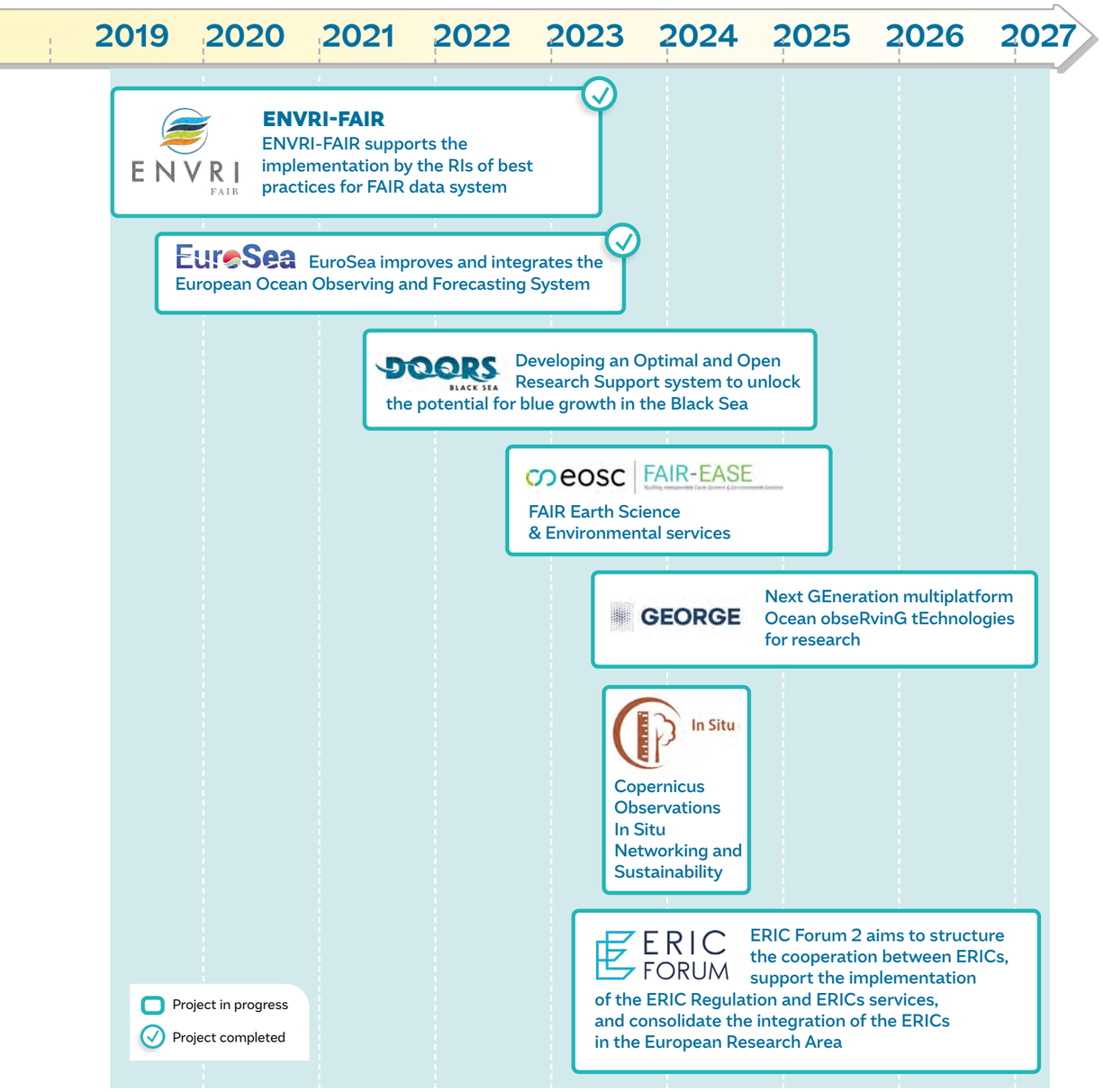
ARGO UK

- Deployed 58 Argo floats, including 47 Core and 11 BGC floats
- Made improvements to the DAC real time processing chain, enhancing the ability to deliver OneArgo, include delivering NKE CTS5 and SOLO deep float data for the first time, and regular delivery of the DOXY-adjusted data to the GDAC in near real-time and delayed mode
- Successfully completed the ENVRI-FAIR project to introduce the NVS vocabulary server to support the management of the Argo metadata reference lists


© Paloma Cartwright (University of Miami)

4 PROJECTS INVOLVING EURO-ARGO IN 2023

In 2023, two EU Horizon 2020 projects ended: ENVRI-FAIR and EuroSea. Meanwhile, Euro-Argo ERIC started two new Horizon Europe projects: GEORGE and ERIC Forum 2, and joined, as third-party, a consortium providing contractual services to the EEA related to the Copernicus In Situ Component: COINS SC3.



EUROSEA

EUROPEAN OCEAN OBSERVING AND FORECASTING SYSTEMS

In the continuation of the AtlantOS project achievements, the EuroSea international consortium aimed at advancing research and innovation towards a user-focused, truly interdisciplinary, and responsive European ocean observing and forecasting system for a sustainable use of the ocean.

2019-2023
Coordination by GEOMAR

- **Funding:** 12.246M€, 821K€ for Euro-Argo ERIC
  European Union's Horizon 2020 innovation action
- **Grant agreement ID:** 862626
- **Call for proposal:** H2020-BG-2019-1

EuroSea

EURO-ARGO CONTRIBUTION

Euro-Argo ERIC was involved in three work packages. The WP3, "Network Integration and Improvements", aimed at improving and strengthening ocean observing networks, fostering network innovations and overseeing key aspects of technological integration. The WP7, "Ocean Climate Indicators Demonstrator", was created to assess the role of the ocean in the climate system through new ocean climate indicators with decreased uncertainty and to evaluate the economic value of the ocean carbon sink. And the WP8, "Communication, Engagement, Dissemination, Exploitation, and Legacy", developed, with OceanOPS, a comic for readers aged 10 and over to learn about the thousands of instruments at sea that take the pulse of the ocean.

MAIN ACHIEVEMENTS IN 2023

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Last EuroSea deployment float during the BOCATS-OVIDE cruise.

In June 2023, the last EuroSea deep Argo float was deployed in the North Atlantic during the BOCATS-OVIDE cruise, to replace the float that failed almost right after its launch at the start of the project. It was deployed together with four other Deep floats from Argo-France to contribute to the observation of water mass property changes, circulation, and acidification in the North Atlantic subpolar gyre. The float had been tested by Euro-Argo ERIC beforehand in early 2023 in the Ifremer hyperbaric chamber and pool, to ensure its proper functioning. As the other EuroSea floats, it is equipped with an oxygen sensor that will bring new data to improve methods to understand and monitor the uptake and storage of carbon in the Irminger Sea and its propagation within the deep circulation. As part of WP7, a study[1] led by Ifremer demonstrates the potential of Argo-O2 observations, combined with existing methods, to obtain reliable anthropogenic carbon estimates. The study, published in Nature Communication in early 2024, highlights the role of water mass transformation as a first-order mechanism for anthropogenic carbon penetration into the ocean interior in the North Atlantic subpolar gyre.
Euro-Argo ERIC Office worked with Ifremer and CNRS, plus some volunteers from the Euro-Argo Management Board, to write a new Argo deployment strategy for the Deep-Argo and BGC-Argo missions. This Deliverable (https://oceanrep.geomar.de/id/eprint/59200/) provides some new insight on how Euro-Argo plans to contribute to one fourth of the OneArgo array at the horizon 2030, including a rationale and some targets in terms of number of floats to be maintained in specific regions.
This new strategy was presented at the EuroSea final General Assembly at UNESCO, Paris, where Euro-Argo communication material was also featured (video and demo-float), as well as in the subsequent EuroSea symposium (https://eurosea.eu/new/eurosea-symposium-highlights-the-urgency-of-integrated-ocean-observing-and-forecasting/), a high level event with many stakeholders from the ocean observing and forecasting community in Europe and beyond.

1. Asselot, R., Carracedo, L.I., Thierry, V. *et al.* Anthropogenic carbon pathways towards the North Atlantic interior revealed by Argo-O2, neural networks and back-calculations. *Nat Commun* 15, 1630 (2024). https://doi.org/10.1038/s41467-024-46074-5

PARTNERS

ENVRI-FAIR

FINDABLE, **A**CCESSIBLE,
INTEROPERABLE AND
REUSABLE SERVICES

ENVRI-FAIR aimed at enhancing the connection of the Cluster of ENVRI to the European Open Science Cloud (EOSC). It supported all participating Research Infrastructures to build a set of FAIR data services to increase efficiency and productivity of researchers and enable data and knowledge-based decisions.

2019-2023
Coordination by FZJ

- **Funding:** 18.99M€, 105,5K€ for Euro-Argo ERIC
  European Union's Horizon 2020 research and innovation action
- **Grant agreement ID:** 824068
- **Call for proposal:** H2020-INFRAEOSC-2018-2

ENVRI FAIR

EURO-ARGO CONTRIBUTION

Built on ENVRIplus achievements, ENVRI-FAIR enhanced access to environmental Research Infrastructure data and products. It was first driven by individual RI user needs, then by marine domain user needs for integrated services. These services will be, in the future, available through the European Open Science Cloud (EOSC). These two themes allowed the project to progress towards the Euro-Argo Five-Year plan objective n°3 **(see p. 18)**. The Euro-Argo and EMSO Research Infrastructures coordinated the WP9 concerning the improvement of the FAIRness of the Research Infrastructures for the Marine subdomain.

MAIN ACHIEVEMENTS IN 2023

Several Argo metadata and data improvements were made possible. A large audit and curation on metadata fields was undertaken by the Euro-Argo ERIC Office, which yielded 780 curated values. Argo vocabulary last historic tables were transferred into the NERC Vocabulary Server (NVS) by the NOC and further discussions occurred to define the NVS tables governance (editing rights, management processes, etc.). Furthermore, access to the Marine Research Infrastructure datasets was improved through the improvement of the Marine EOV broker delivered in a 2.0 version by Ifremer.

The sustainability of integrated data systems (EOSC as a system of systems) was discussed in a white paper (deliverable D9.10 of the project): "*Marine subdomain white paper for sustainable data management*" (https://archimer.ifremer.fr/doc/00846/95804/).

This white paper was a collaborative effort, led by the Euro-Argo ERIC Office, with inputs from representatives of every Marine Research Infrastructure involved. The resulting white paper contains ten recommendations that cover various aspects, including financial (and integration costs), technical (and traceability), and environmental considerations. The objective of these recommendations is to address sustainability issues and support the integration of the Marine subdomain into the European Open Science Cloud (EOSC).

Euro-Argo ERIC took part in the ENVRI Week in Leipzig in February 2023. Often cited as an example for the Fairness of its data that has been implemented *ab initio* in the network, Euro-Argo also shared in this instance how a European Research Infrastructure can contribute with a strong engagement to a global programme, namely Argo, by encompassing 1/4th of the fleet. Euro-Argo ERIC attended the Lund conference held at the occasion of the Swedish presidency of the European Union (June 2023) and dedicated to "*The Potential of Research Data – How research infrastructures support new opportunities and benefits for society*". This was indeed a forum in which Euro-Argo ERIC could express its concern on the usage of Open and Free data in a cascade of products, for instance by the fast developing sector of digital twins of the Ocean (or even of the Earth system), if the use of these data is not specifically mentioned. In Lund, Euro-Argo ERIC also attended the ENVRI-FAIR side-event dedicated to the presentation of the ENVRI-hub to high-level stakeholders, therefore demonstrating the network's commitment to this impressive way of sharing information to a much wider scope of users, in a transdisciplinary mindset.

© FZJ

Group picture at the ENVRI Week in Leipzig in February.

PARTNERS

Euro-Argo · Ifremer · BODC

DOORS

DEVELOPING AN **O**PTIMAL AND **O**PEN **R**ESEARCH **S**UPPORT SYSTEM TO UNLOCK THE POTENTIAL FOR BLUE GROWTH IN THE BLACK SEA (DOORS)

The overall objective of DOORS is to work with stakeholders to implement the Strategic Research Innovation Agenda (SRIA) for the Black Sea, to support the successful implementation of Blue Growth and to contribute to a healthy, productive and resilient Black Sea.

2021-2025

Coordination by National Institute of Marine Geology and Geoecology - GeoEcoMar

- **Funding:** 9M€ 180k€ for Euro-Argo ERIC
- European Union's Horizon 2020 research and innovation action
- **Grant agreement ID:** 101000518
- **Call for proposal:** H2020-EU.3.2.3.3

EURO-ARGO CONTRIBUTION

Euro-Argo's goal is to demonstrate the potential of BGC Argo, as part of the integrated multiplatform observing system for the Black Sea. Euro-Argo ERIC is involved in two work packages: WP4 "Deep knowledge" and WP8 "Stakeholders engagement".

MAIN ACHIEVEMENTS IN 2023

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Two BGC Argo floats nicknamed 'Dolphin' and 'Siren' (WMO 7901065 and 4903711) were successfully deployed in the Romanian Exclusive Economic Zone (EEZ) in the Black Sea on 11th and 15th May 2023. These floats currently stand as the sole active measuring platforms for chlorophyll-a concentration, irradiance, and nitrate concentration. This data collection aims to provide valuable insights into climate and environmental changes occurring in one of the world's most polluted seas.

Team deploying the two BGC Argo floats in the Black Sea in May.

PARTNERS IO-BAS GeoEcoMar

FAIR EASE

FAIR-EARTH SCIENCE & ENVIRONMENTAL SERVICES

The overall objective of FAIR-EASE is to customise and operate distributed and integrated services for observation and modelling of the Earth system, environment and biodiversity, by improving their different components implemented in close cooperation with user-communities, the European Open Science Cloud (EOSC) and Research Infrastructures in their design and sustainable availability.

2022-2025

Coordination by CNRS

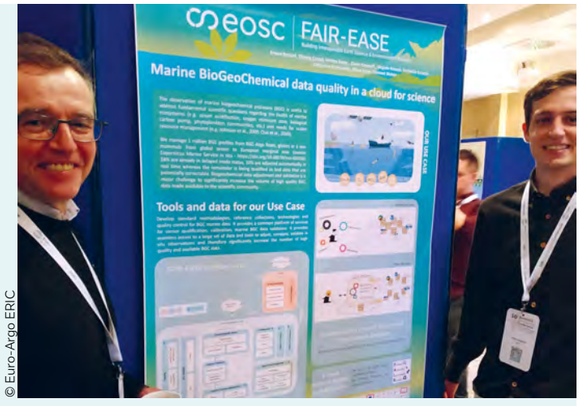
- **Funding:** 4.7M€ 61.2k€ for Euro-Argo ERIC
- European Union's Horizon Europe research and innovation action
- **Grant agreement ID:** 101058785
- **Call for proposal:** HORIZON-INFRA-2021-EOSC-01

EURO-ARGO CONTRIBUTION

Euro-Argo ERIC is involved in a use-case where new tools and external datasets for the calibration, validation and correction of ocean BGC data are developed. These new services will be made available to BGC data scientists through a massive, high-performance, distributed data infrastructure able to combine, *in situ*, satellite and model data **(see Figure 19)**.

MAIN ACHIEVEMENTS IN 2023

In the framework of WP6, Euro-Argo contributed to assess the FAIRness of FAIR-EASE tools and data. This work was based on the methodology developed in the FAIR-IMPACT project. Late 2023, TRUST-IT produced a series of videos on each of the FAIR-EASE use cases. In that framework, a representative of each use case was interviewed on the main challenges faced in their respective scientific domain when it comes to data and services interoperability. Euro-Argo took part in this series for the BGC use case, explaining how FAIR-EASE results would help in answering these challenges. The use case BGC (within WP5) greatly progressed with the further development of the use case architecture and containerising (integration) of softwares by POKaPOK. Softwares needed for calibration were provided by, and integrated in collaboration with, the CNRS. This activity is still in progress. The ERIC reviewed and commented on the Nitrate workflow and the associated draft user interface, including the configuration possibilities. Ifremer has continued the development of the system that will host the FAIR-EASE use cases and has upgraded and shared collaborative tools. A poster was presented at the 10th EuroGOOS Conference, highlighting the use case contribution to the improvement of ocean biogeochemical data quality in a cloud environment.



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Presentation of the poster on the use case at the 10th EuroGOOS Conference in Galway.

PARTNERS Ifremer cnrs

GEORGE

NEXT GENERATION MULTIPLATFORM OCEAN OBSERVING TECHNOLOGIES FOR RESEARCH INFRASTRUCTURES

The overall objective of GEORGE is to advance the global technological competitiveness of European ocean observing Research Infrastructures (EMSO, ICOS, Euro-Argo ERICs) in the characterisation of the ocean carbon system, through the development and demonstration of a state-of-the-art biogeochemical, multi-platform observing system from sensor to data repositories.

2023-2027

Coordination by ICOS ERIC

- **Funding:** 7.7M€
  690k€ for Euro-Argo ERIC
  European Union's Horizon Europe research and innovation action
- **Grant agreement ID:** 101094716
- **Call for proposal:**
  HORIZON-INFRA-2022-TECH-01

GEORGE

EURO-ARGO CONTRIBUTION

Euro-Argo ERIC and its partners (SU, Ifremer, CNRS, IOW,) are deeply involved in all work packages except for sensor development: exploitation and communication, platform improvements, data integration and interoperability, training, implementation and demonstration (WP3, WP4, WP5, WP6 and WP7).

PARTNERS

Ifremer · Sorbonne Université · CNRS · IO-BAS

MAIN ACHIEVEMENTS IN 2023

Euro-Argo and its partners participated in the Kick-Off meeting and preparation meetings in March, where the project tasks were presented and work to be carried out further refined.

As part of the WP3 Innovation on Ocean Platform Technology, work for the integration of an acoustic sensor (for wind speed measurements) on BGC Argo floats - enabling CO_2 flux calculations - started with technical and scientific requirements and selection of a supplier. The development of a Linux kernel to simplify new sensor and software integration on BGC CTS5 Argo floats began with choices regarding hardware, studies and validation of examples of programming structures in a Python environment. There was also progress on the update of a profiling float specifically designed and optimised to operate in shallow and coastal waters. Technical data of past Arvor-C deployments have been examined and reviewed, performances assessed and limitations listed. New features have been proposed and some existing functionalities kept. Work began on how to reduce the carbon footprint and waste of ocean observing. Possible improvements of the environmental aspects of Argo floats were reviewed, including the impact of production, easing visual identification and improving the energy budget assessment.

Euro-Argo contributed to the WP5 meetings and provided inputs to the deliverable D5.1 Technology validation and prototyping SOP and trials project plans, as well as inputs to D5.2 Report describing data acquired from each field trial, and the WP5 Global Schedule Excel file regarding the deployments of Argo floats (coastal Arvors, Provors CTS5).

In WP6, the planning of the first Technical Forum *in situ* training was the main task. The aim of this training course is to enable all Members of the three ERIC communities (Euro-Argo, EMSO and ICOS) to learn about the basic technical principles of the different platforms used in GEORGE. This training will happen in May 2024 in Villefranche-sur-Mer. Euro-Argo also compiled a list of existing learning material on the Argo platform, which can feed both the online platform and the hands-on training.

Euro-Argo ERIC is co-leading WP7 on Exploitation, Communication, Sustainability and Impact. The first initiative proposed was to pave the way for new observation data and products uptake by operational services such as the Copernicus Marine Service. Euro-Argo prepared a meeting to gather, in the spring of 2024, representatives of Copernicus Entrusted Entities to discuss the needs and gaps in terms of Argo data at an operational level. Euro-Argo ERIC also participated in the elaboration of the project Communication Plan and materials, as well as drawing up newsletter contents and interviews.

All the work was eventually presented and discussed with project partners at the General Assembly organised in Villefranche-sur-Mer in October.

© Maria Luhtaniemi/ICOS ERIC

Group photo at the GEORGE General Assembly in Villefranche-sur-Mer in October.

ERIC-FORUM 2

SECOND IMPLEMENTATION PROJECT FOR THE ERIC FORUM

The Second Implementation Project for the ERIC Forum (EF2) is a four-year EU-funded project set up to further structure the cooperation between the European Research Infrastructure Consortia (ERICs) and to support the implementation of the ERICs' policy, shaping their community identity and consolidating their integration within the European Research Area (ERA). EF2 started in September 2023.

2023-2027

Coordination by BBMRI ERIC

- **Funding:** 2.999M€ 113.5K€ for Euro-Argo ERIC
- European Union's Horizon Coordination and Support Actions
- **Grant agreement ID:** 101124559
- **Call for proposal:** HORIZON-INFRA-2023-ERIC-ART195-IBA

CONTEXT

Since its establishment in 2009, the ERIC regulation has provided an easy-to-use legal framework on governance, operational, and scientific matters which has facilitated the formation of consortia of Member States to create research infrastructures responding to scientific and global challenges. The success and impact of ERICs and the ERIC regulation on the European research and innovation landscape cannot be overstated. However, over the past fourteen years, the now 28 ERICs have been exposed to the reality of the implementation of the ERIC regulation. ERICs face common challenges related to, for instance, governance and organisational matters, financial sustainability, the implementation of the VAT exemptions, or the definition of limited and non-economic activities. The requirement to follow and implement respective laws of the host countries also led to various interpretations of the Regulation, preventing Member States and the management of the ERICs to leverage the full potential of the ERICs.

EURO-ARGO CONTRIBUTION

© ERIC FORUM

Yann-Hervé De Roeck at the ERIC FORUM Annual Meeting in Brussels in February.

In this context, Euro-Argo ERIC will lead two of the major EF2 work packages dedicated to "Sustainability of ERIC services, transnational and virtual access" (WP5) and to "Addressing the challenges of the implementation of the ERIC Regulation, including the VAT exemption" (WP12), respectively.
The first objective of the WP5 is to analyse the challenges of operational sustainability of ERICs and provide policy recommendations on how to address them. The second is to analyse the conditions for the development and deployment of commercial services and provide policy recommendations. And the third is to develop the deployment of, and funding schemes for access to ERICs.
The WP12 also has three objectives. The first being to identify challenges, negative consequences and barriers, linked to the implementation of the regulation and propose mitigation strategies. The second to identify challenges and practical hurdles regarding the implementation of the VAT exemption, including its interpretation and use at national level. And the third to deliver policy recommendations to tackle the issues related to the implementation of the ERIC Regulation and VAT exemption.
The two work packages will contribute to the consolidation of the research infrastructures and the sustainability of their operations and services. From a Euro-Argo ERIC perspective, these issues are key for a successful transition to OneArgo.

COINS SC3

COPERNICUS OBSERVATIONS *IN SITU* NETWORKING AND SUSTAINABILITY SPECIFIC CONTRACT NR. 3

2021-2025

COINS Consortium Leader: EUMETNET

- Contract under European Environment Agency (EEA) Framework
- **Contract number:** EEA/DIS/R0/20/001
- **Funding:** 24.5k€ for Euro-Argo ERIC as third-party to the consortium

CONTEXT

Copernicus Services such as the Copernicus Marine Service (CMEMS) and the Copernicus Climate Change Service (C3S) rely on environmental measurements collected by data providers (ground-based, sea-borne or air-borne monitoring systems) as well as geospatial reference or ancillary data, collectively referred to as *in situ* data. The Copernicus In-Situ Component, a task entrusted to the European Environment Agency (EEA), maps the landscape of *in situ* data availability, identifies data access gaps or bottlenecks, supports the provision of cross-cutting data and manages partnerships with data providers to improve access and use conditions. These data providers include Research Infrastructures (RIs) such as Euro-Argo ERIC. The COINS Consortium, led by the network of European National Meteorological Services (EUMETNET), is assisting the EEA in accomplishing the observation-related activities pertaining to the cross-cutting coordination of the Copernicus In-Situ Component, covering inter alia marine *in situ* observations.

EURO-ARGO CONTRIBUTION

Euro-Argo ERIC is a third-party to the COINS Consortium and is involved in the work package WP3 "State of Play". As the key *in situ* oceanographic network for operational applications, Argo is a major data provider and natural partner of the Copernicus Services. The ERIC will organise, in March 2024, a workshop gathering the Entrusted Entities in charge of delivering the Copernicus Services, namely EEA, Mercator Ocean International (MOI), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the European Centre for Medium-Range Weather Forecasts (ECMWF) and the European Space Agency (ESA).
COINS SC3 extends from August 2023 to September 2024. In 2023, Euro-Argo ERIC started the organisation of the workshop and the preparation of a background document including information on the international Argo Programme, the ERIC, OneArgo and the essential ocean variables measured by Argo, and the operational and sustainability challenges of OneArgo. The ERIC also drafted a Research Infrastructure Brief that should be used by COINS/EEA to raise awareness and strengthen the connection and exchange of information between the RIs, Copernicus Entrusted Entities, and the European Commission.

PARTNERS IO-BAS GeoEcoMar

5 SCIENTIFIC HIGHLIGHTS

Decreased surface and bottom salinity and elevated bottom temperature in the Northern Baltic Sea over the past six decades

Authors: Harri T. Kankaanpää et al.
First published: 10th of February 2023
https://doi.org/10.1016/j.scitotenv.2022.160241

Abstract

In contrast to other marine water bodies, the Baltic Sea is a semi-enclosed, non-tidal, stratified, brackish water sea with low water volume. Introduction of large amounts of water in major Baltic inflows from the North Sea to the Baltic Sea, renewing deep layers, have occurred only sporadically in the 1960ˢ and 1970ˢ, 1993, 2003, 2014 and 2023. The Baltic Sea suffers from several environmental problems related to, for example, hydrography and various sources of pollution. Despite measures taken to improve the situation, anoxia and hypoxia, harmful algal blooms and toxic chemicals are still widespread. Temperature and salinity are crucial factors, setting the boundaries for the water's characteristics and thus controlling marine habitats and gas fluxes. Despite previous research, there are still numerous gaps in the understanding of long-term changes in salinity, saline water inflows and vertical mixing in the Baltic Sea.

This study provides enhanced understanding regarding long-term and recent changes in the Northern Baltic Sea's thermohaline conditions. The data was obtained from 14 Swedish and 33 Finnish ship-based monitoring stations, in place since the 1960s, and Argo floats which have been deployed in the Baltic Sea since 2012. Data from monitoring stations was classified into two depth bins: 0 to 3 m from the surface and 0 to 10 m from the bottom. The Northern Baltic Sea was divided into five sub-basins for more precise conclusions: Bothnian Bay, Bothnian Sea, Eastern Baltic Proper, Northern Baltic Proper and Gulf of Finland.

Its main conclusions are the following:

- The temperature in near-bottom water has increased by 0.75–2.9°C in all the Baltic Sea areas examined during 1957/1962–2021, especially since 1996, with record-high temperatures in several locations during 2016–2021, suggesting that global climate change is exerting an increasing impact.
- Surface salinities predominantly declined by 0.31–1.14 units between 1957/1963 and 2021. With a few exceptions, long-term near-bottom salinities declined by 0.35–1.45 units, mostly contributing to declines from 1975 to 1995 and in the Bothnian Bay from 1996.
- Argo data shows that there has been diminishing temperature-to-salinity coupling during 2012–2021, which is consistent with the enhancing global change effect.
- Attention should be paid to the evolution of deep and intermediate waters in the Northern Baltic Proper. Especially the intermediate layer waters which are essential in the ventilation of deep waters in the Bothnian Sea.

These results are alarming for many reasons. One is that increasing near-bottom temperatures can enhance the oxidation of organic matter and oxygen consumption which, in turn, increases anoxia and the generation of toxic hydrogen sulfide and methane. Another is that diminishing salinity can elicit habitat-level changes leading to disturbances in food webs. Considering the fragility of the Baltic Sea food webs with its low number of species, the observed long-term thermohaline changes pose a severe threat which may potentially cascade throughout the ecosystem.

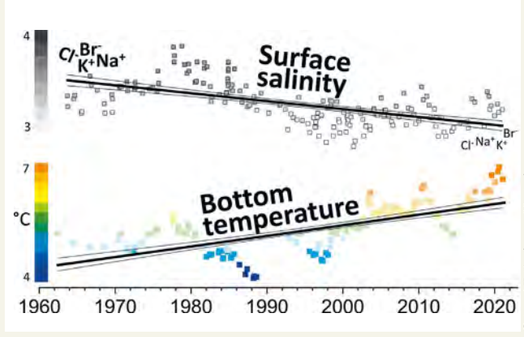

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Figure 15: Evolution of the surface salinity and bottom temperature of the water in the Northern Baltic Sea since the 1960s (composite illustrative graph, see publication for precise data).

Using machine learning and BGC-Argo floats to assess biogeochemical models and optimize observing system design

Authors: Alexandre Mignot et al.
First published: 12th of April 2023
https://doi.org/10.5194/bg-20-1405-2023

Abstract

Since preindustrial times, the ocean has absorbed ~26% of total anthropogenic CO_2 emissions, leading to dramatic change in the ocean's biogeochemical (BGC) cycles, such as ocean acidification. Moreover, deoxygenation and change in the biological carbon pump are now manifesting globally. Therefore, along with plastic pollution and an increase in fisheries pressure, major changes are occurring in marine ecosystems at a global scale. In order to contextualize the monitoring of ongoing changes, derive climate projections and develop better mitigation strategies, realistic numerical simulations of the oceans' BGC state are required.

Numerical models of ocean biogeochemistry are becoming the major tools used to detect and predict the impact of climate change on marine resources and to monitor ocean health. They produce three-dimensional estimates of a large number of chemical and biological variables that are dynamically consistent with the ocean circulation. However, these models are far from being flawless, mostly because there are still huge knowledge gaps in the understanding of key BGC processes and, as a result, the mathematical functions that describe BGC fluxes and the ecosystem dynamics are too simplistic.

This study provides a new method to simplify model-data comparison, based on the conjoint use of a k-means clustering technique, 23 assessment metrics and Biogeochemical-Argo (BGC-Argo) float observations. The k-means algorithm and the assessment metrics reduce the number of model data points that need to be evaluated. The use of BGC-Argo observations as the sole evaluation data set ensures the accuracy of the data, as it is a homogenous data set with strict sampling methodologies and data quality control procedures. The method is applied to the Global Ocean Biogeochemistry Analysis and Forecast system of the Copernicus Marine Service. The k-means algorithm identified eight BGC regions in the model simulation that are consistent with the work of Fay and McKinley (2014). Within each BGC region and for each assessment metric, a model efficiency statistical score is computed, that quantifies whether the model outperforms the BGC-Argo climatology. Overall, the model surpasses the BGC-Argo climatology in predicting pH, dissolved inorganic carbon, alkalinity, oxygen, nitrate, and phosphate in the mesopelagic and the mixed layers as well as silicate in the mesopelagic layer. For the other metrics, whose model predictions are outperformed by the BGC-Argo climatology, the study provides suggestions to reduce the model data misfit and, thus, increase the model efficiency.

The method can also be used to optimize the design of the BGC-Argo network. The authors strongly recommend enhancing the observation density in the Arctic region and maintaining the existing high density of observations in the Southern Oceans. These are two regions where the model error is barely less than the variability in BGC-Argo observations and where it is not possible to use satellite observations to constrain the model for the most part of the year due to ubiquitous cloud cover.
This study thus illustrates how the synergic use of modeling and BGC-Argo data can both provide information about the performance of models and improve the design of observing systems.

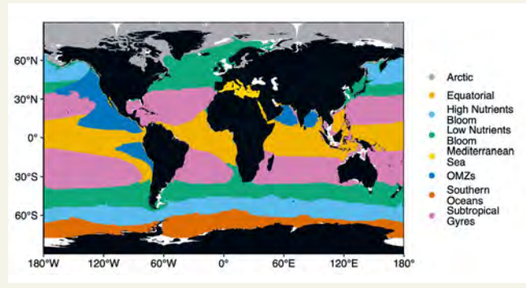

Figure 16: This map shows eight distinct zones in the ocean created by machine learning analysis. The analysis looked at time series of different aspects of ocean biogeochemistry simulated by the Mercator ocean biogeochemical model. These zones represent areas where similar biogeochemical processes occur in the ocean.

6 FINANCIAL STATUS

The Euro-Argo ERIC 2023 accounts reflect the need to evaluate the ERIC's incomes and costs as comprehensively as possible. In particular, this involves fully valuing the in-kind contributions of the host institution to the Office, which were previously not visible in the accounts. The result is a balance sheet higher than in previous years. Although the income statement displays a structural deficit for the second year, -132 k€, the financial position of the ERIC remains strong, with a stockholder equity above 1 M€. With a transparent budget, a consolidated workforce and a healthy order book, the ERIC is building up its assets to take on, with its Members, the challenge of implementing OneArgo.

The overall balance sheet is 10% higher than last year: 3,800 k€ versus 3,476 k€. It should be noted, however, that 2023 is the last year for which floats purchased through the former central procurement procedure generated a significant turnover (1,511 k€), which is to be considered separately from operating incomes and expenses. The new central procurement procedure, by which the floats remain the property of the ERIC, generated a cash flow of 1,479 k€ in 2023. Only a tiny part of it is included in the current income statement given the depreciation rules and the partial deployments of the purchased floats. The balance sheet also encompasses 931 k€ of deferred incomes related to projects in the order book, since project expenses and incomes (including the corresponding overheads) are now accounted for year after year, as they are justified. As an important line in the overall balance sheet, the cash at hand is reaching 1.6 M€, allowing the ERIC to cope with any types of delay in transfer.

Within the yearly income statement, EU-funded projects represent the vast majority of the operating grants. They support the share of activities that the fees, unchanged since 2014, and the host contribution are not covering. EU funding is indispensable to enhance the capacities of Euro-Argo ERIC, notably in light of the transition to OneArgo, and also to foster synergy with the other marine research infrastructures. However, it should be clear that R&I EU-funded projects will not be sufficient to fulfil the ambitions of OneArgo, as they usually do not allow for the large-scale acquisition of profilers.

EURO-ARGO 2023 FINANCIAL STATUS

TYPE	DEBIT	CREDIT
OPERATING INCOME		**1001**
Subscription Member/Observer		370
Operating grants		475
In-kind Ifremer		128
Central procurement contributions		24
Other incomes		3
OPERATING EXPENSES	**1133**	
Wages and social contributions	**586**	
Salaries	313	
External personnel	273	
Amortization on fixed assets	**311**	
Floats on central procurement	22	
Other floats and assets	289	
Other external expenses	**236**	
Telecommunication (satellite)	58	
Travels – receptions- seminars	48	
Public relations	16	
Legal fees	22	
Rental	37	
Insurance	8	
Others expenses	48	
LOSS	**132**	

Table 5: Simplified income statement in k€.

In conjunction with the inflation rate in 2023, some accounting lines display higher figures than in the previous year because they now fully incorporate the in-kind support of the host institution, namely for the office and storage rental and the seconded personnel. Priority has also been given, in 2023, to the reinforcement of the team (1 FTE more than in 2022) to ensure that the most needed skills are represented at the Office.

In conclusion, the income statement shows an indisputable loss, but remains compatible with the financial status of the ERIC, which holds a net treasury above 1 M€ after discounting all debts, liabilities and residual value of floats.

Table 6 reports the Members' in-kind contributions to the Euro-Argo programme. This also benefited from the general effort in assessing the in-kind support. Requested by ESFRI, this includes the number of floats purchased, the number of floats deployed, the human resources dedicated to the programme and the consolidated budget of the national programmes. The assessment of the full-time equivalent workforce and of the overall financial effort enables a real account of the European contribution to OneArgo through Euro-Argo ERIC. On the basis of the current average lifespan of the floats, taking their share of the full OneArgo design would require European partners to deploy approximately 260-300 floats per year at the horizon 2030. The consolidated figures are encouraging but not sufficient to ensure the implementation of the OneArgo design, especially given that the average float costs and data management costs will drastically increase. Ensuring the long-term financial sustainability of the Euro-Argo network requires a strong investment in advocacy in order to secure additional, recurrent sources of funding at a national and EU level.

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Testing the Arvor Deep CTS4 floats at the test basin in Brest, France.

EURO-ARGO MEMBERS AND CANDIDATE 2023 CONTRIBUTION

COUNTRY	FLOATS PURCHASED	FLOATS DEPLOYED	FULL TIME EMPLOYEE	CONSOLIDATED BUDGET OF NATIONAL ARGO PROGRAMMES
Bulgaria	3	2		0.090
Denmark				0.299
Finland	2	4	0.25	0.175
France		68	16.7	6.831
Germany		38	4.3	2.291
Greece		4	1	0.086
Ireland	6	0	0.1	0.060
Italy	27	18	2.3	5.490
Netherlands	6	12	0.1	0.141
Norway	5	8		0.730
Poland	7	5	1.5	0.496
Spain		8	2.1	0.103
UK	30	58	3.1	2.797
ERIC Office	3	3	7.8	0.760
Total	89	228	39.3	20.350

Table 6: Euro-Argo Members and Candidate 2023 contribution.

ANNEX 1 - GLOSSARY

ACCC
Atmosphere and Climate Competence Center

ADMT
Argo Data Management Team

AIC
Argo Information Centre

AMRIT
Advance Marine Research Infrastructures Together

ASD
Abrupt Salinity Drift

AST
Argo Steering Team

AtlantOS
All-Atlantic Ocean Observing System

BGC
Biogeochemical

BODC, NOC
British Oceanographic Data Centre, National Oceanography Centre

BSH
Federal Maritime and Hydrographic Agency of Germany

CMEMS
Copernicus Marine Environment Monitoring System

CNRS
French National Centre for Scientific Research

COINS
Copernicus Observations In Situ Networking and Sustainability

Core
Standard Argo float measuring temperature and salinity (T/S)

CSIC
Spanish National Research Council

DAC / GDAC
Data Assembly Centre/ Global Data Assembly Centre

Deep
Argo floats diving to greater depths than 2000 meters

DO
Dissolved Oxygen

DOORS
Developing an Optimal and Open Research Support

DMQC
Delayed Mode Quality Control

DTU-Aqua
National Institute of Aquatic Resources

ECMWF
European Centre for Medium-Range Weather Forecasts

EMD
European Maritime Days

EMODnet
European Marine Observation and Data Network

EMSO
European Multidisciplinary Seafloor and water column Observatory

ENVRI
Environmental and Earth System Research Infrastructures

ENVRI-FAIR
ENVRI- Findable, Accessible, Interoperable and Reusable services

ENVRIplus
ENVRI- Providing Shared Solutions for Science and Society

EOOS
European Ocean Observing System

EOSC
European Open Science Cloud

EOV
Essential Ocean Variables

ERA
European Research Area

ERIC
European Research Infrastructure Consortium

ERIC Forum
Network of ERICs to strengthen their coordination and interact effectively with the EC

ESFRI
European Strategy Forum on Research Infrastructures

EU
European Union

Euro-Argo RISE
Euro-Argo Research Infrastructure Sustainability and Enhancement

EuroGOOS
European Global Ocean Observing System

EuroSea
European Ocean Observing and forecasting systems

EVE
Earth Virtualization Engine

FAIR-EASE
FAIR Earth Science & Environmental serviees

FMI
Finnish Meteorological Institute

FTE
Full-Time Equivalent

FVON
Fishing Vessel Observing Network

FZJ
Forschungszentrum Jülich research institute (Germany)

GDAC
Global Data Assembly Centre

GeoEcoMar
The national Institute for Research and Development of Marine Geology and Geoecology of Romania

GEOMAR
Helmholtz Centre for Ocean Research Kiel

GEORGE
Next Generation multiplatform ocean observing technologies for research

GOOS
Global Ocean Observing System

HCMR
Hellenic Centre for Marine Research

ICOS
Integrated Carbon Observation System

IEO
Spanish Institute of Oceanography

Ifremer
French national institute for ocean science and technology

IMR
Institute of Marine Research

IO PAN
Institute of Oceanology of the Polish Academy of Sciences

IO-BAS
Institute of Oceanology – Bulgarian Academy of Sciences

IOW
The Leibniz Institute for Baltic Sea Research, Warnemünde

KNMI
Royal Netherlands Meteorological Institute

KPI
Key Performance Indicator

LOV
Laboratory of Oceanography of Villefranche

MB
Management Board

MI
Marine Institute

MOCCA
Monitoring the Oceans and Climate Change with Argo

MSFD
Marine Strategy Framework Directive

NERSC
Nansen Environmental and Remote Sensing Center

NVS
NERC Vocabulary Server

OceanOPS
The WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology in situ Ocean Observing System Monitoring and Coordination Centre

OGS
Italian National Institute of Oceanography and Applied Geophysics

OneArgo
The United Nations endorsed set of actions to reach a global and multidisciplinary ocean observing array

R/V
Research Vessel

SCOR
Scientific Committee on Oceanic Research

SOCIB
Balearic Islands Coastal Observing and Forecasting System

SOOS
Southern Ocean Observing System

SOP
Standard Operating Procedures

SRIA
Strategic Research Innovation Agenda

STAG
Scientific and Technical Advisory Group

SU
Sorbonne University

T/S
Temperature/Salinity

UVP
Underwater Vision Profiler

VAT
Value Added Tax

WHOI
Woods Hole Oceanographic Institution

WMO
World Meteorological Organisation

WP
Work Package

ANNEX 2 - PARTNERS OF EURO-ARGO ERIC

Country	Statute	Representing Organisation
Bulgaria	Member	IO-BAS
Denmark	Candidate	DTU-Aqua
Finland	Member	FMI
France	Member	Ifremer
Germany	Member	BSH
Greece	Member	HCMR
Ireland	Member	MI
Italy	Member	OGS
Netherlands	Member	KNMI
Norway	Member	IMR
Spain	Member	SOCIB, IEO-CSIC
United Kingdom	Member	Met Office
Poland	Member	IO PAN

*** The listed institutes represent the Member States, but other institutes in the country can also participate in the Euro-Argo activities.**

ANNEX 3 - EURO-ARGO ERIC GOVERNANCE BODIES

	Profession / Position
Council Members	
Jean-Marie Flaud	*Chair* - MESR France
Elena Mauri	*Vice-Chair* - OGS - Italy
Jon Turton	Met Office – UK
Aristomenis Karageorgis	HCMR – Greece
Sybren Drijfhout	KNMI – Netherlands
Mikko Strahlendorff	FMI – Finland
Kerstin Jochumsen	BSH – Germany
Marta Stawicka	Ministry of Education & Science – Poland
Odd Ivar Eriksen	Research Council of Norway - Norway
Joaquin Tintoré	SOCIB – Spain
Glenn Nolan	Marine Institute - Ireland
Atanas Palazov	IO-BAS - Bulgarian Academy of Sciences Bulgaria
Pierre-Yves Le Traon	Special Advisor to the French representative - France
Karen Edelvang	DTU-Aqua - Denmark
Management Board Members	
Birgit Klein	*Chair* – BSH – Germany
Laura Tuomi	*Vice-Chair* – FMI – Finland
Alan Berry	Marine Institute – Ireland
Dimitris Kassis	HCMR – Greece
Pedro Vélez-Belchi	IEO-CSIC – Spain
Virginie Thierry	Ifremer – France
Kjell Arne Mork	IMR – Norway
Waldemar Walczowski	IO PAN – Poland
Andreas Sterl	KNMI – Netherlands
Fiona Carse	Met Office – United Kingdom
Giulio Notarstefano	OGS – Italy
Violeta Slabakova	IO-BAS – Bulgaria
Colin Stedmon	DTU-Aqua – Denmark

	Profession / Position
Euro-Argo ERIC Central Research Infrastructure	
Yann-Hervé de Roeck	Programme Manager Ifremer France
Francine Loubrieu	Administrative Assistant Ifremer France
Romain Cancouët	Operational Engineer Euro-Argo ERIC
Claire Gourcuff	Science Officer Euro-Argo ERIC
Estérine Evrard	Project Manager Euro-Argo ERIC
Marine Bollard	Communication Officer Euro-Argo ERIC
Delphine Dobler	Data scientist Euro-Argo ERIC
Luc van Dyck	Advisor for policy and partnership relations Euro-Argo ERIC
Scientific & Technological Advisory Group (STAG)	
Henry Bittig	IOW Germany Research
Inga Lips	EuroGOOS Secretary General EOOS
Susan Wijffels	WHOI USA – Argo International
Johnny Johannessen	NERSC Norway Copernicus Marine Service
Philip Browne	ECMWF UK – Weather forecasting and Coupled Data Assimilation
One Euro-Argo ERIC expert assists the STAG	
Hervé Claustre	LOV France – Bio-Argo

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