

ACHIEVEMENTS AND FUTURE CHALLENGES

2014-2023



EUROARGO

EUROPEAN RESEARCH
INFRASTRUCTURE CONSORTIUM
FOR OBSERVING THE OCEAN





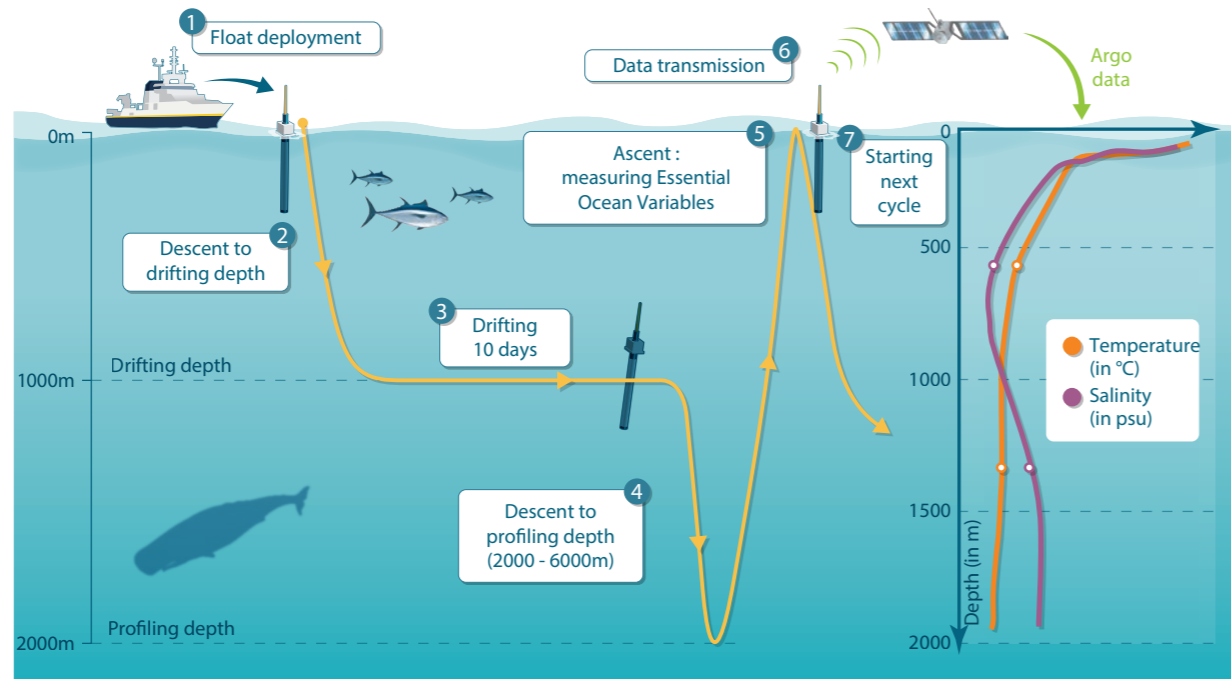
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WHAT IS ARGO?

Argo is the first global real-time in situ observing network in the history of oceanography.

- Argo represents a fleet of about 4000 autonomous floats, deployed all over the world ocean.
- They carry sensors to report temperature, salinity and 6 biogeochemical parameters (oxygen, chlorophyll a, suspended particles, downwelling irradiance, nitrate and pH).
- Argo floats perform measurements while actively going up and down the water column.
- They provide an unprecedented free and open quality-controlled dataset to a wide range of users.

TEN DAYS CYCLING OF AN ARGO FLOAT



4 YEARS
Argo float's life time expectancy

10 DAYS
for a full cycle

12 HOURS
for transmission to data centres



© Lauren O'Dell



WHAT IS EURO-ARGO?

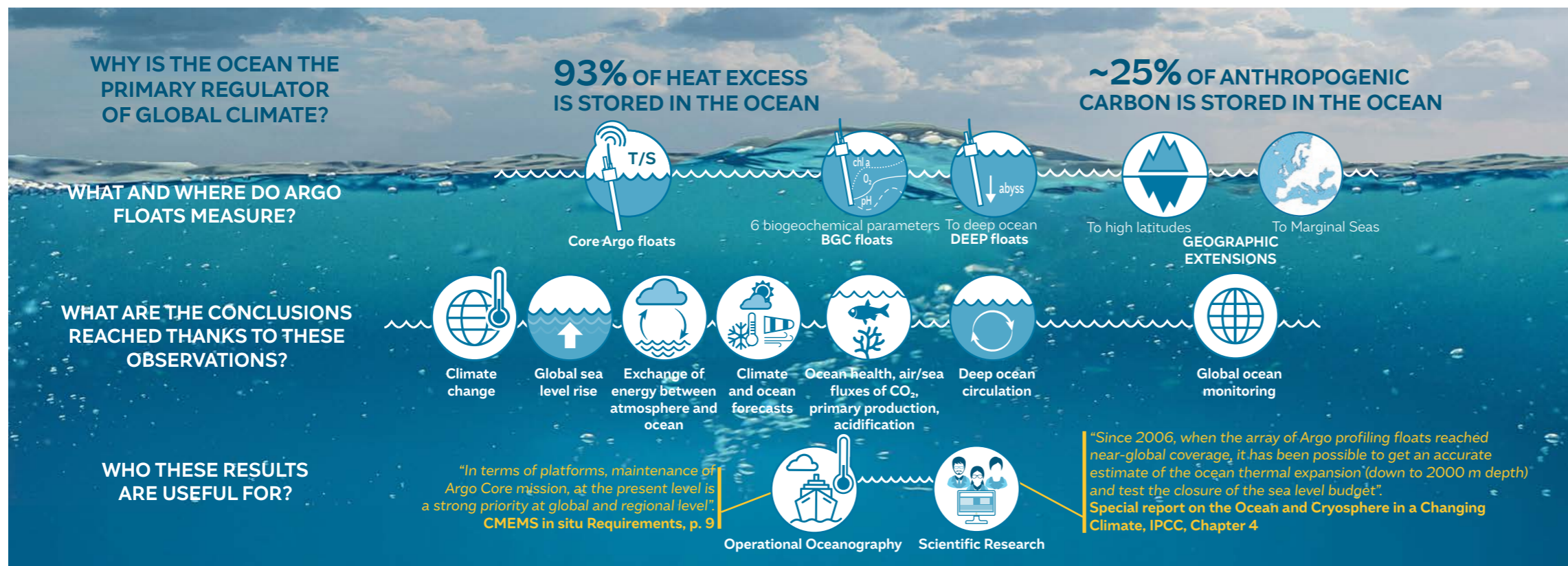
Euro-Argo sustains and optimises the European contribution to the international Argo programme, providing, deploying and operating nearly 25% of the floats network.

- Established in 2014, the Euro-Argo European Research Infrastructure Consortium (ERIC) has matured to the stage that it is now able to initiate network upgrades in response to specific European research interests, especially towards high latitudes, biogeochemistry (BGC) measurements to study ecosystem parameters and greater depth, till the abyss.
- The Euro-Argo ERIC is composed of 12 countries, and is coordinated by the Euro-Argo ERIC Office, hosted by Ifremer (France).
- Argo's success is mainly due to the high degree of international cooperation behind the initiative and European partners have played a crucial role in setting up and developing the Argo network.

OBJECTIVES OF THE FIRST FIVE YEARS

- 1** To maintain 25% of the global array **25% OF THE FLEET**
- 2** To provide additional coverage in the European regional seas **MARGINAL SEAS**
- 3** To develop further the infrastructure: improving float technology and adding new sensors, improving the data processing and distribution system
- 4** To provide quality-controlled data and products to the researchers in climate and oceanography fields, and to the operational communities - e.g. Copernicus Marine Environment Monitoring Service (CMEMS)

WHY STUDY THE OCEAN?



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MAIN ACHIEVEMENTS OF EURO-ARGO ERIC FIRST FIVE YEARS

BENEFITS FOR EURO-ARGO MEMBERS

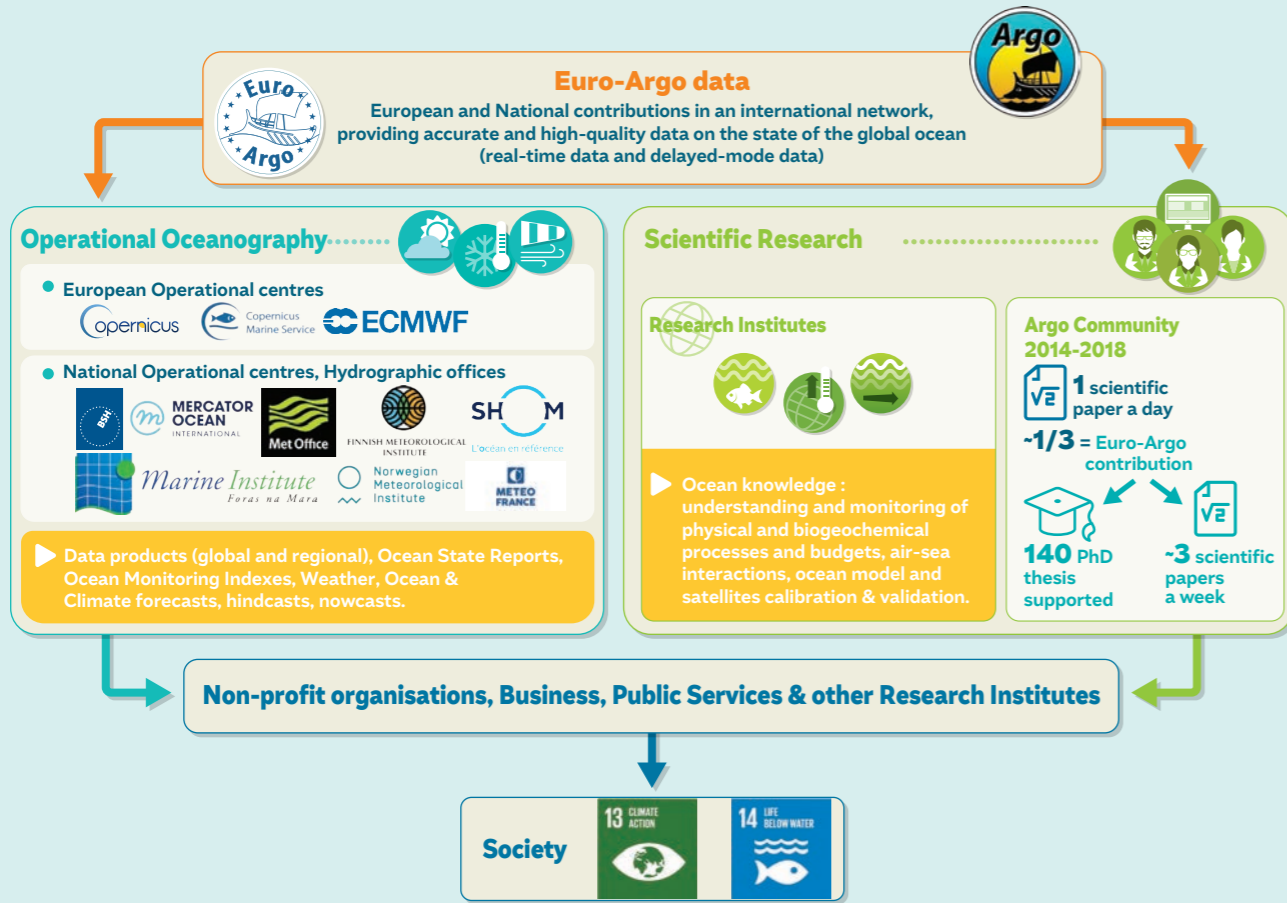
- To achieve its objectives, the Euro-Argo ERIC has established a **high level of cooperation** between the 12 National Members and the ERIC Office.
- Euro-Argo ERIC ensures **coherence with Argo international strategy**, enlarging its community of data users and responding to their needs.

- The past 5 years have seen consolidation of:
 - Centralised float procurement and deployment.
 - Coordinated “At-sea operations”, floats testing and monitoring activities, maximising float life expectancy to increase cost-effectiveness of the Argo programme.
 - Strengthened **integrated data processing** and services.
 - Joint outreach and training efforts. Euro-Argo organised the 1st European Argo Delayed Mode Quality Control (DMQC) data workshop in 2018.



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BENEFITS FOR SCIENTISTS AND OPERATIONAL OCEANOGRAPHY



A SIGNIFICANT CONTRIBUTION TO GEOGRAPHIC EXTENSIONS



MARGINAL SEAS

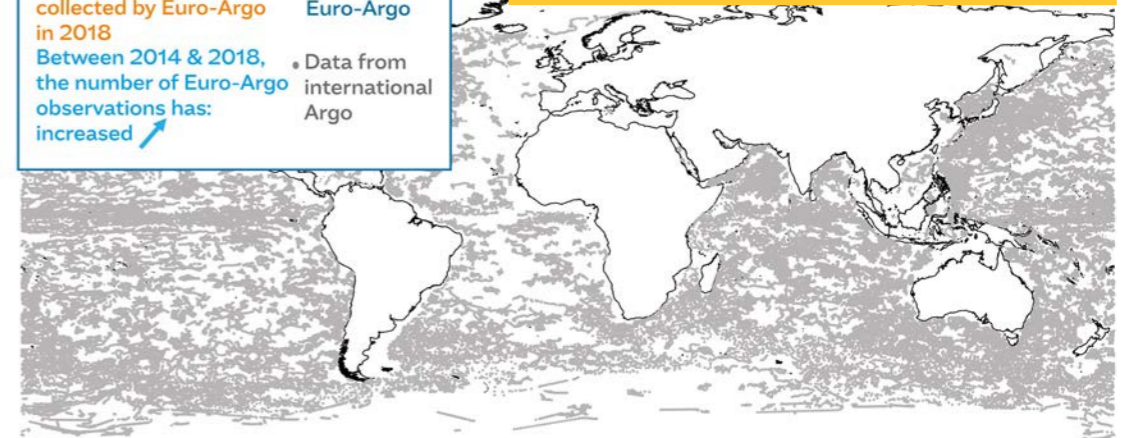


HIGH LATITUDES

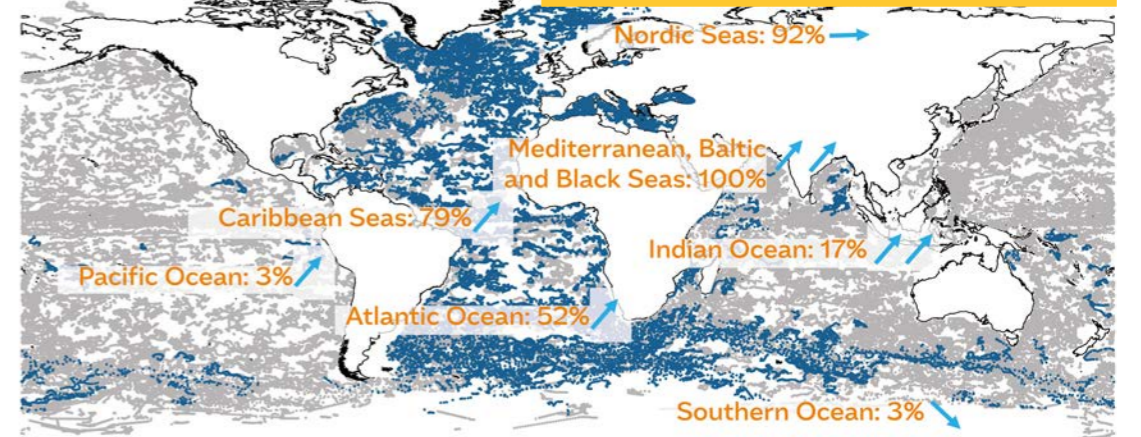
% of all observations collected by Euro-Argo in 2018
Between 2014 & 2018, the number of Euro-Argo observations has increased

- Data from Euro-Argo
- Data from international Argo

ARGO NETWORK WITHOUT EURO-ARGO CONTRIBUTION

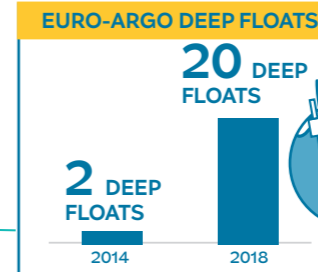
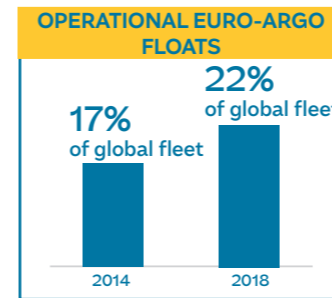


ARGO NETWORK WITH EURO-ARGO CONTRIBUTION



All the CTD profiles collected in 2018. The % represents the portion of the 2018 global Argo profiles collected by Euro-Argo floats in each area.

A BOOST FOR EXTENSION TO BIOGEOCHEMICAL & DEEP ARGO

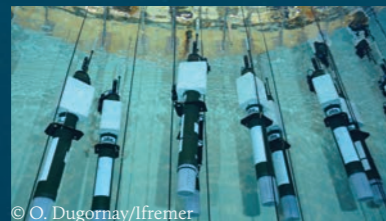


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5 YEARS OF MAJOR MILESTONES FOR EURO-ARGO ERIC

2014

- ERIC established
- Feasibility demonstration for fleet monitoring



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2015

- BGC real-time processing implementation at EU DACs and GDAC
- Implementation of the “At-sea monitoring” service
- Deployment and processing of a large fleet of floats
- Contribution to global array and extension to Marginal Seas, polar regions, the deep ocean and to biogeochemical variables



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2016

- Publication of the long-term evolution strategy
- Implementation of the Delayed Mode Quality Control (DMQC) for O₂ & chlorophyll a thanks to Euro-Argo
- New services for Members: “central procurement of Core and Deep floats”



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2017

- Implementation of Southern Ocean Argo Regional Centre (BODC)



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2018

- Goal 1: concept and governance development
- Goal 2: data management
- Goal 3: operational development



KEY PERFORMANCE INDICATORS (KPIs) OF EUROPEAN CONTRIBUTION TO THE INTERNATIONAL NETWORK



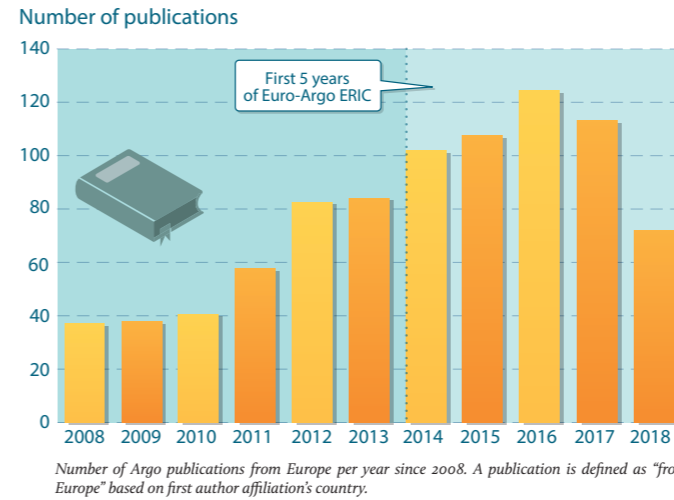
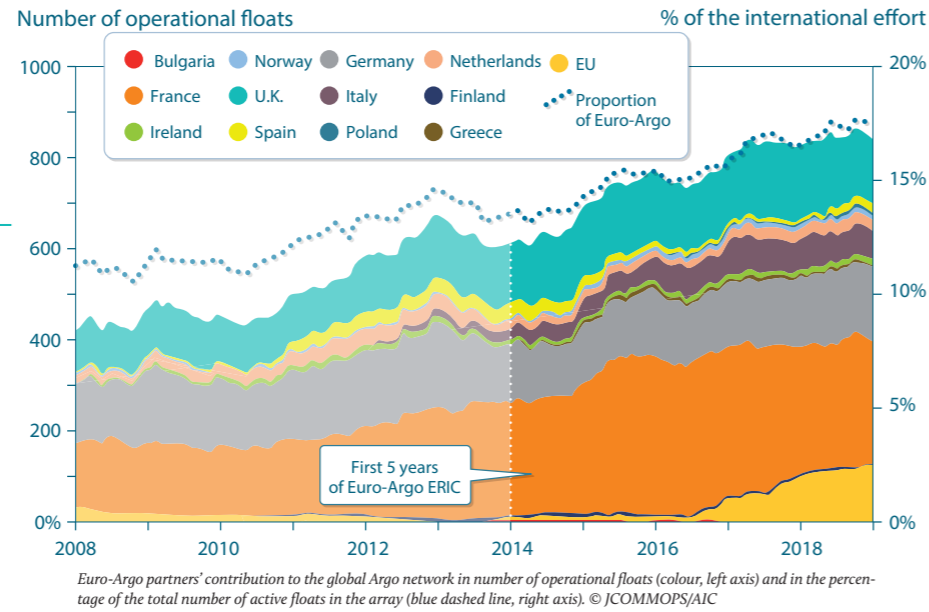
KPIs REGARDING USERS

CONTRIBUTION TO THE NETWORK

- The number of floats increasing year on year since the beginning of the project

In 2018, the array was around 4000 active floats, i.e. a target of 1000 new floats to be deployed per year at global scale, including 350 by the Euro-Argo ERIC. 279 European floats were actually deployed, including 66 floats on the extension to biogeochemical and deep oceans.

The “European Union” contribution in the last 3 years, through H2o2o and EMODnet projects, has been crucial.



- Record number of Euro-Argo scientific papers

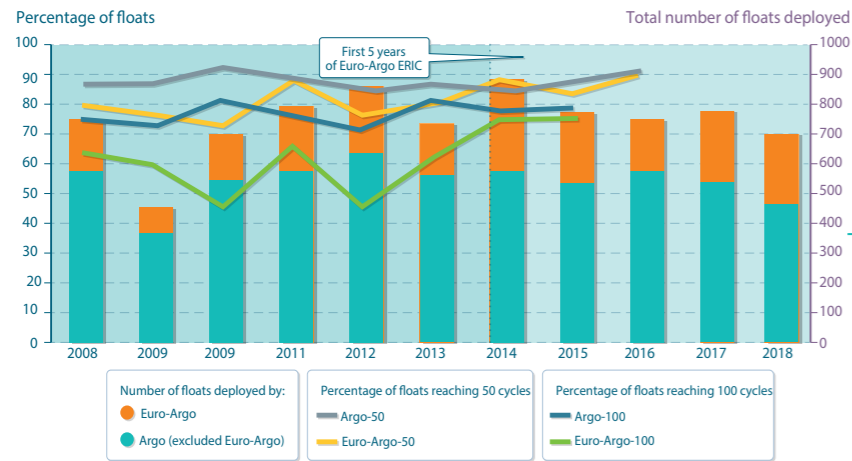
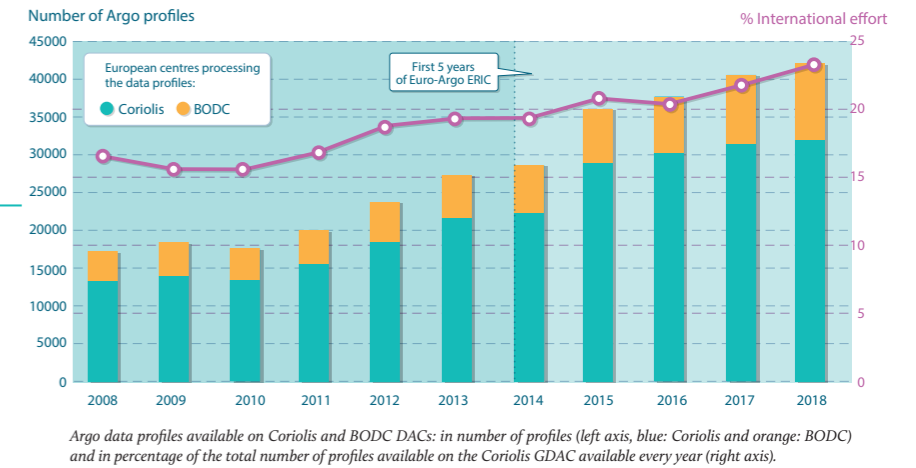
Similar to Argo international, Argo publications from the Euro-Argo community reached a new record in 2016, with 125 papers published. Since 2008, the European contribution has exceeded the initial target of 25% of the total number of publications, reaching almost 30%.

- Increasing Argo Data availability

Europe (Coriolis, France) hosts one of the two Global Data Assembly Centres (GDAC) for Argo that contains the whole official Argo dataset.

In November 2018, more than 2 million Argo profiles were available on Coriolis GDAC.

The contribution of the European DACs (Coriolis, BODC) is significant, reaching more than 24% of the international effort in 2018.



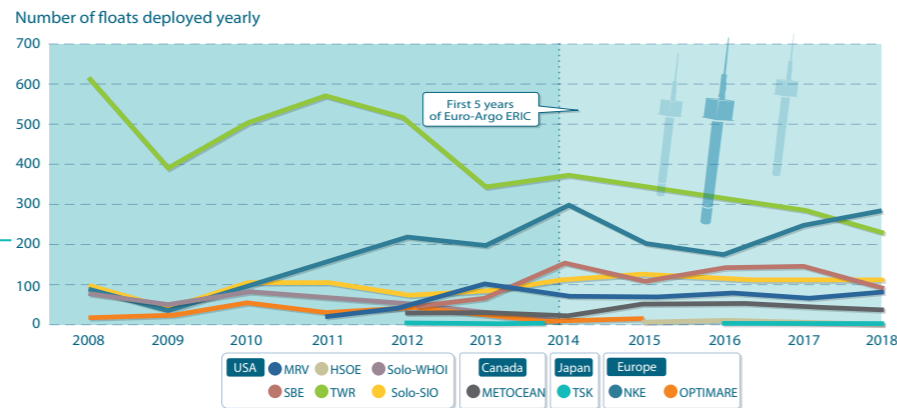
- Impressive progress for float performance

The life expectancy of European floats is improving and the target of 4 years – around 150 cycles for a standard float cycling with a 10 day-period – has been achieved on average.

On recent deployments, the Euro-Argo fleet has a similar score for the percentage of floats reaching the 50 cycles target and the 100 cycles target as the rest of the fleet (about 90% and 75% respectively).

- A European manufacturer is top float supplier

In 2018, for the first time, a European manufacturer (NKE, delivering ARVOR and PROVOR float models) is number 1, ahead of US manufacturers (e.g. Teledyne Webb Research (TWR) providing the APEX).



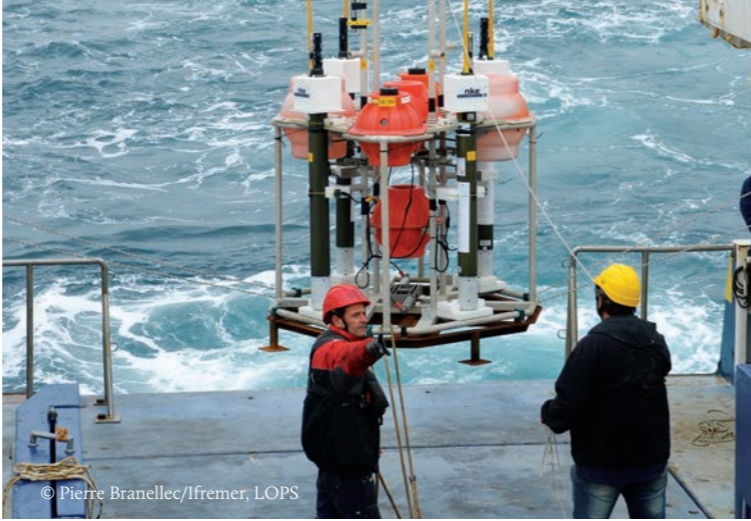
- New twitter followers

Since its creation in July 2016, the Euro-Argo twitter account has continuously gained new followers, reaching

573 followers in December 2018.

WHAT ARE THE NEXT CHALLENGES?

Many activities and services have been implemented over the past five years. However, these achievements need to be continued and developed in the next phase of Argo programme. There are multiple challenges including: the maintenance of Core Argo activities, the extension towards a «Global, full-depth and multidisciplinary Argo design» that needs to be further developed in a sustained way. To reach these goals, the Euro-Argo ERIC will focus on the following objectives:



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5 OBJECTIVES FOR 2019 - 2023

1

Sustain the existing Core Argo mission.



2

Develop the extension of Euro-Argo contribution to the «Global, full-depth and multidisciplinary Argo mission», particularly for the BGC and DEEP network.



3

Develop scientific and technological coordination with other ocean observing networks and contribute to a Global Ocean Observing System design and its European contribution through the European Ocean Observing System (EOOS) initiative.



4

Increase the engagement with European Argo user communities and stakeholders and reinforce Euro-Argo visibility.

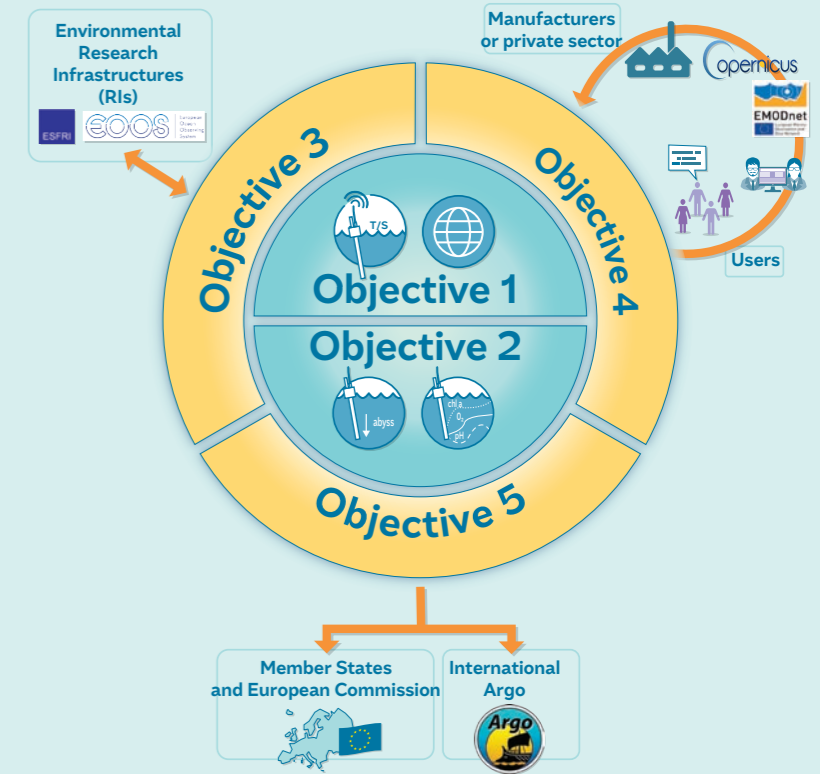


5

Operate the Euro-Argo ERIC under good governance.



See "FIVE-YEAR PLAN 2019-2023" report



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EURO-ARGO FUTURE SCIENTIFIC FOCUS



DEEP ARGO



BGC ARGO



HIGH LATITUDES

- Technological advances will allow observations of unknown regions and properties of the ocean that play key roles in ocean ecosystems and Earth climate.
- Extensions towards deep ocean will provide crucial data to better estimate heat and freshwater budgets and sea level variations in the ocean.
- Extensions towards high latitudes and coastal areas will allow a better understanding of ocean variability in these key regions of the globe.
- Extensions into the biogeochemical component will enable the investigation of the effects of acidification and deoxygenation on marine ecosystems, as well as monitoring various elements of ocean health.



"Half of the ocean's volume has yet to be observed by Argo."

"The North Atlantic is believed to represent the largest ocean sink for atmospheric carbon dioxide in the Northern Hemisphere, yet little is known about the temporal variability of this parameter."

"We are at a time where there is only a rudimentary understanding of the ocean biological system."

"Changes in Ocean dynamics that are not observed or well understood can result in significant economic costs to society and societal impacts."

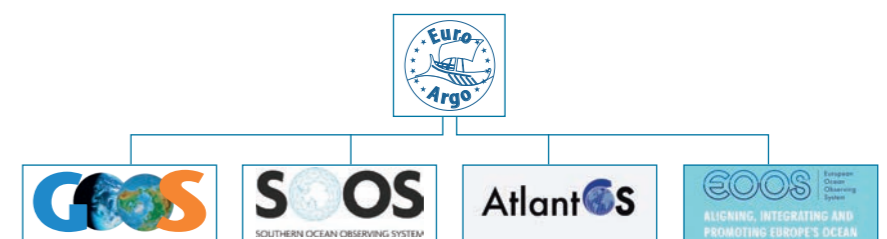
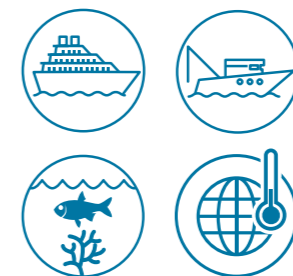
See "FIVE-YEAR PLAN 2019-2023" report

EURO-ARGO ERIC INFRASTRUCTURE PARTNERS FOR THE NEXT 5 YEARS

• Research Infrastructures (RIs), collaborating towards an integrated ocean observing system approach to sensor developments and data interoperability.

• Private sector, including industries with a significant maritime presence, or climate-focus.

• Stakeholders, for a societal engagement, including end users of ocean observation, modelling products and services that use BGC Argo data.





EURO-ARGO MEMBERS TESTIMONIALS



Guillaume Maze,
Argo-France,
Ifremer

«The ERIC has actively contributed to the sustainability of the Argo-France programme and provided new opportunities to strengthen Argo-France activities: EU-funded projects coordinated by the Euro-Argo ERIC (E-AIMS, MOCCA, Euro-Argo RISE) have led to new technological developments and tests to improve the historical Argo mission and to allow the new one. The ERIC has also led a strong reinforcement of European industry through new opportunities for manufacturers and improvement of catalogues.

Funds for floats procurement have been secured and new opportunities for deployments emerged. Argo-France also benefited from improved coordination with international partners, as well as development and sharing of good practices, in order to prepare floats before deployments and better monitor fleet performances.»

«For the Netherlands and other Euro-Argo members with a small Argo contribution – less than 10 floats deployed per year – benefits from being part of the Euro-Argo ERIC are multiple, ranging from help with float procurement, to an easier collaboration with other scientists.

Since 2017, the Euro-Argo ERIC offers the possibility of centralised float purchase at significant discount rates. For floats purchased through this contract, the ERIC Office technical team undertakes the whole logistic chain from ordering the floats, via performing an acceptance test in the Ifremer testing facilities, to the shipment of the floats to the purchasing institutes, or directly to the deployment ports of call. Furthermore, Euro-Argo ERIC provides technical advice on float parameter settings and the characteristics of sensors. After deployment, it also allows the access to DMQC and monitoring tools. Together, these services make it much easier for small partners to buy, launch and operate their floats.

Through organizing workshops (e.g. training workshop on Argo data Delayed Mode Quality Control) and user meetings, Euro-Argo also enhances the exchange of knowledge between the partners.»



Andreas Sterl,
Argo-
Netherlands,
KNMI

«Partly through Norway's involvement in Euro-Argo and the scientific collaborations that resulted (e.g. E-AIMS project), NorArgo2 project was successfully granted in 2017, providing secured funds for 5 years. This new project enables Norway to operate 30 Argo floats (including BGC and DEEP Argo floats) in the Nordic Seas, the Arctic Ocean and the Barents Sea, thus significantly contributing to the implementation of the European strategy for Argo. Norway benefits from the expertise of the Euro-Argo ERIC, in terms of technical advises on floats and sensors, purchase of floats, and data processing and Quality Control.»



Kjell Arne Mork,
NorArgo, IMR



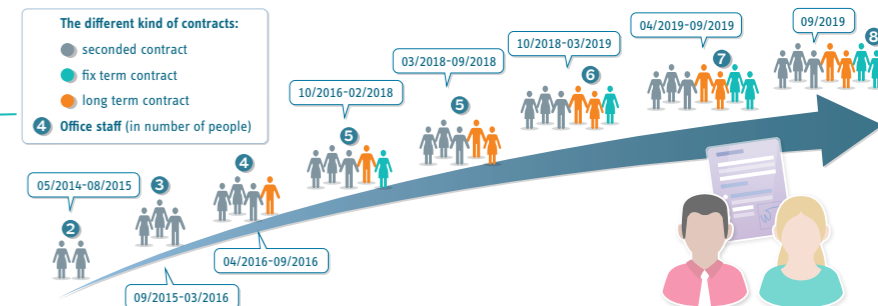
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EURO-ARGO BUDGET

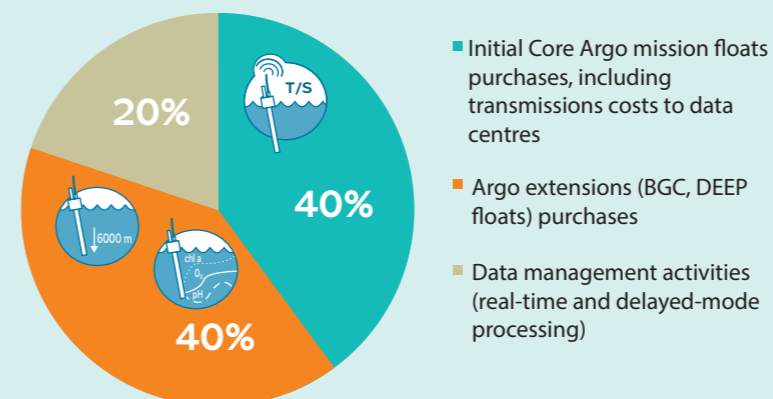
Over the past 5 years, the Euro-Argo ERIC's overall budget (national and centralized) has ranged between €6 and €8 million, depending on income from EU-funded projects. Approximately 90% of the budget comes from the National Members and covers the costs of float procurement, deployment, data transmission and data processing. It does not encompass research and development (R&D) activities.

A GROWING TEAM SINCE THE IMPLEMENTATION OF THE ERIC

The ERIC Office's 2018 budget, managed at the ERIC Office, is €1.2 million, with 30% coming from Member fees and 70% from European project funding (including purchases of additional floats).



EURO-ARGO ERIC AND MEMBERS' BUDGET (2014-2018)



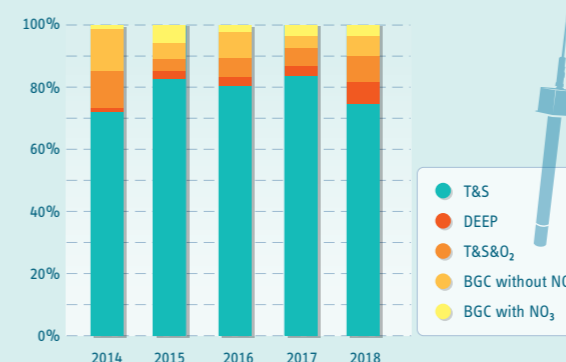
A CHALLENGING BUDGET DEDICATED TO FLOAT PURCHASE

• Euro-Argo ERIC receives stable and sustained funding from its Member countries to support infrastructure operations. Research and development activities are carried out through projects funded at either national or European level (H2020 and EMODnet projects).

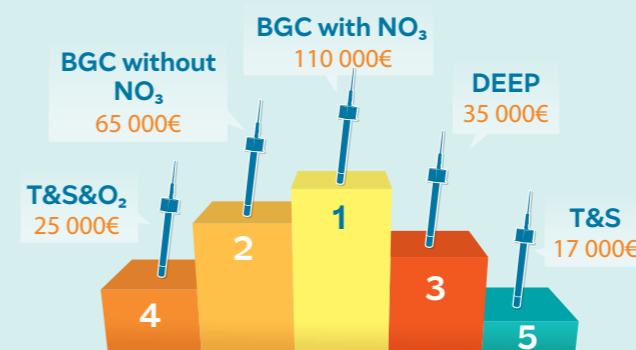
• In the past five years, the Euro-Argo ERIC has started to develop Argo extensions, which represent nearly 50% of the purchased floats budget and between 20-30% of the number of floats.

• The prices of the different types of floats show that DEEP and BGC floats double the total cost for the same number of floats.

EVOLUTION OF THE TYPE OF FLOATS DEPLOYED PER YEAR BY EURO-ARGO



AVERAGE PRICE OF THE VARIOUS FLOAT TYPES DEPLOYED BY EURO-ARGO



TS: temperature and salinity; O₂: Oxygen; NO₃: Nitrate

Fostering the development of the new design - **three times more expensive than the initial Core Argo mission** - will require Euro-Argo to engage with the EU to complement national funding programmes.



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• The Euro-Argo ERIC contributes significantly to the challenge of observing the global ocean, on a sustained basis, across an increasing range of essential ocean variables, and playing a prominent role in the international Argo programme.

• As a major component of the Global Ocean Observing System (GOOS), the Argo programme is actively participating in monitoring and understanding climate change and its impact on ocean health. It contributes to two of the 17 Sustainable Development Goals (SDGs) adopted by all United Nations (UN) Member States in 2015:



2 SUPPORTS



12 COUNTRIES

2014, 9 Members:
Finland, France, Germany, Greece, Italy, Netherlands, Norway, Poland & UK

2016, 10 Members:
+ Ireland

2017, 11 Members:
+ Spain

2018, 12 Members:
+ Bulgaria

Ocean Data
Climate Innovation
Collaboration
Society Europe
Scientists Observations
Geographic extensions
International
Common good



2014

Euro-Argo ERIC has started to develop Argo extensions

2018

Euro-Argo targets by 2030 are in agreement with the Argo vision: «Global, full-depth and multidisciplinary Argo mission»

2022

One of Euro-Argo's goal for 2021-2030 is to contribute to the «UN Decade of Ocean Science for Sustainable Development»



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See also **ACTIVITY REPORT 2014-2018** and **FIVE-YEAR PLAN 2019-2023**

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