ACTIVITY REPORT 2019

EUROARGO

EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM FOR OBSERVING THE OCEAN

Foreword

Welcome to the Annual Activity Report of Euro-Argo ERIC!

In 2019 the Euro-Argo ERIC celebrated its 5th anniversary. The year was quite intensive with many interesting events and tasks.

The internal scientific evaluation of the Euro-Argo ERIC was prepared by the Euro-Argo Management Board and Office and successfully conducted. The Scientific and Technical Advisory Group (STAG) performed the reviewing and presented a positive outcome and some advice to the Council. The plan for the next 5 years of operation (2019 – 2023) was also evaluated. It includes five objectives to sustain and develop the Euro-Argo program, to engage new users and to boost the visibility of the ERIC and its activities. The achievements and activity report of the first 5 years of operation and the plan for the next five years were published in December 2019.

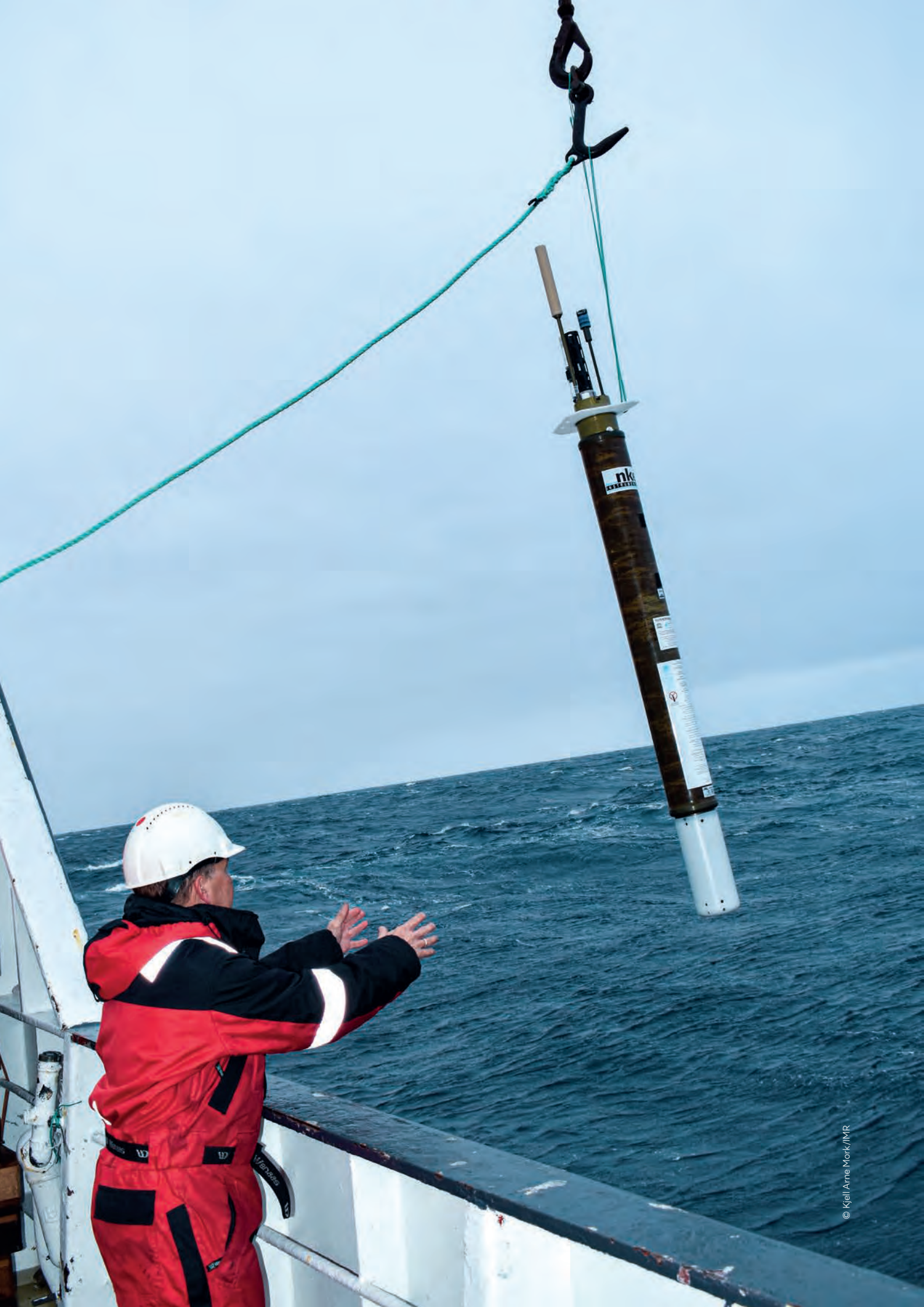
One of the highlights of 2019 was the 7th Euro-Argo Science Meeting organised in Athens, Greece, on October 22nd – 23rd. This meeting gathered 69 scientists from 17 countries and included various presentations about scientific highlights and progress made within the Euro-Argo ERIC. The Euro-Argo Office further boosted the meeting thanks to new communication and interaction methods, including online interaction tools, live demos and awards for best talk and poster.

The Argo deployments faced some challenges in 2019, due to delays encountered in float purchase and also in float repairs due to Seabird CTD recall. Nevertheless, 189 floats were deployed, which is a significant contribution to the Global Argo network, representing 25% of all Argo deployments in 2019. The float procurement service provided by the Office was continued, including handling of the acceptance tests in the Ifremer facilities. Six Members utilised the procurement service purchasing a total of 62 floats.

Euro-Argo has also been involved in several projects. The European strategies for the Observing systems was advanced in the AtlantOS and EuroSea projects and thanks to collaboration between European Environmental Research Infrastructures in ENVRIplus and ENVRI-FAIR. The MOCCA project, nearing its end in 2019, contributed 150 floats to the Argo network over its five-year lifetime. MOCCA also enhanced the capability to monitor the Argo floats through new fleet monitoring service and focused on improving data quality methods to provide high quality data for the scientific community. The Euro-Argo RISE project started in 2019. The Office coordinated this project engaging large number of the Members. Euro-Argo RISE will continue to further enhance and extend the European Argo network. Specific attention is put on biogeochemical (BGC) and Deep Argo floats and on enhancing the use of Argo floats in the shallow Marginal Seas and in partially ice-covered areas.

We wish you a pleasant time exploring the annual report and finding out about the Euro-Argo ERIC activities in 2019!

Birgit Klein, Chair, BSH – Germany
Laura Tuomi, Vice-Chair, FMI – Finland



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Executive summary

2019 has been an intense year, marked by the positive evaluation of the first 5 years of the ERIC, where the Research Infrastructure (RI) was set-up and new services for Members developed. The new 5-year plan (2019-2024), elaborated jointly by the ERIC office, Members and Observers, was published in December 2019. It describes the five new objectives of the ERIC to implement the new international Argo mission and develop a sustained European contribution.

Euro-Argo five objectives aims to:

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

The Euro-Argo ERIC was well involved in key European projects and the Euro-Argo Office coordinated the MOCCA and Euro-Argo RISE projects.

Implementation of the 5-year plan started through European and national projects. In particular, the Euro-Argo ERIC was well involved in key European projects (ENVRI-FAIR, EuroSea, building respectively on ENVRIplus and AtlantOS achievements and ERIC-Forum) and the Euro-Argo Office coordinated the MOCCA and Euro-Argo RISE projects.

This year the ERIC office team has also grown with the arrival of two new persons: Estérine Evrard in April, to assist the Euro-Argo RISE coordinator on a daily basis and Marine Bollard in October, on communication activities.

As a contribution to the Argo network, the total number of floats deployed by the Members and the ERIC in 2019 (189), although still below 350, represents more than 25% of international Argo deployments, with NKE European manufacturer staying the first provider. The number of floats deployed in 2019 is lower than the number of floats deployed last 2 years, mainly due to delays in deployments. It is also due to the fact that some floats were DEEP or biogeochemical (BGC) floats that respectively cost 2 times and 6 times the cost of a Core Argo float.

In 2019, 62 809 Argo data profiles have been processed by the two Argo Data Assembly Centres (DAC), Coriolis/Ifremer, and BODC. Nearly 75% of the European floats have been scientifically assessed to reach the accuracy needed for climate applications.

In addition to the data processing itself, both Ifremer and BODC have been able to progress in different aspects of Argo data management, in the framework of the MOCCA, Euro-Argo RISE and ENVRI-FAIR EU projects:

– A new method based on the use of a Min-

Max climatology has been implemented in near-real time at Coriolis GDAC;

– At the last Argo Data Management Team (ADMT) meeting, an improvement of the spike test has been proposed by Ifremer and endorsed by Argo international;

– Work has started within ENVRI-FAIR project at BODC to use the NERSC Vocabulary Server to provide Machine readable access to all the reference tables;

– Regarding management BGC Argo data, work has started within Euro-Argo RISE project both for improving methods of Quality Control (QC) and for the organization of the Data flow at European level;

A survey was also issued by BODC to assess DMQC methods for Argo data at international level with the goal to develop best practices and share common tools. Eventually, a github repository has been created to centralize all existing tools used in Argo data management in a common repository open to everyone.

The MOCCA and Euro-Argo RISE projects, coordinated by the ERIC Office, are important projects for the infrastructure as they support and foster the infrastructure development with joined actions at Office and Member state level. In 2019, near the end of the project, Euro-Argo ERIC ensured all MOCCA project's milestones were met and deliverables submitted and started the preparation of a main achievement brochure for the European Commission and the Ministries. One year after its launch, Euro-Argo RISE work is also progressing according to schedule: the 5 deliverables and 4 milestones due by the end of 2019 have been released (out of 63 deliverables in total). Significant developments have been achieved regarding: technology, data management, networking, outreach, training and engagement with stakeholders.

Activities aiming at increasing Euro-Argo visibility were pursued in 2019, through 42 news published along the year on Euro-Argo website. The twitter account continued to gain new followers, reaching 573 followers at the end of the year (an increase of 232) and the first press release was published. Euro-Argo capacity in communicating with different audiences has been enhanced since Autumn 2019 with the arrival of Marine Bollard, Euro-Argo ERIC new communication officer and the publication of the three major documents coming out of Euro-Argo 5-year internal evaluation.

Significant developments have been achieved in the framework of Euro-Argo RISE project regarding technology, data management, networking, outreach, training and engagement with stakeholders.

As far as projects are concerned, the budget execution is as planned for MOCCA, AtlantOS and ENVRIplus, and incomes following the project reporting period justification are expected second half of 2020 as both AtlantOS and ENVRIplus have been extended until respectively September 2019 and June 2019. In 2019, Euro-Argo continued seeking additional funds, through the setting up of several proposals in response to H2020 calls issued by the European Commission. The ERIC is involved in the EuroSea, ERIC-Forum and ENVRI-FAIR projects that started in 2019. The ERIC was also involved in the MOISSE BGG7-C proposal that is first on the waiting list for this call.

This year, the report highlights two scientific results published in 2019 in which Argo data play a critical role: the study of V. Racapé et al. (2019) on the ISOW Spreading and Mixing in the Charlie-Gibbs fracture zone and the study of D. March et al. (2019) on the integration of animal-borne instruments into global ocean observing systems. The Euro-Argo ERIC has also been involved in the Argo community white paper ▸ https://doi.org/10.3389/fmars.2019.00439 submitted to the OceanObs'19 conference in Hawaii, where 1500 scientists from all continents gathered.

1 FIVE-YEAR PLAN OBJECTIVES

Over the past five 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. To follow this international guideline and reach programme sustainability, Euro-Argo published in December 2019 its Five-Year plan (see Part 4, p. 38).

▸ *See the full 5-year plan on https://doi.org/10.13155/71936*

In this new plan, Euro-Argo has articulated 5 objectives against which its achievements will be measured in the coming years.

The challenges of this next phase are multiple:

1) Core Argo activities need to be maintained.

2) Extensions towards the "Global, full-depth and multidisciplinary Argo missions" need to be further developed in a sustainable way.

3) Engagement with existing and new end-users is necessary to meet societal needs. Euro-Argo is not alone and must evolve within a landscape of complementary Research Infrastructures (RIs). An integrated ocean observing system approach has been defined by several observation networks (GOOS at global scale, AtlantOS at basins level and 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 networks as efficiently as possible.

To face these challenges, the 5 Euro-Argo new objectives are interconnected and many partners are involved → **Figure 1**.

This report describes the activities carried out by the Euro-Argo ERIC with respect to the 5 objectives.

THE FIVE OBJECTIVES OF THE NEW 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 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.

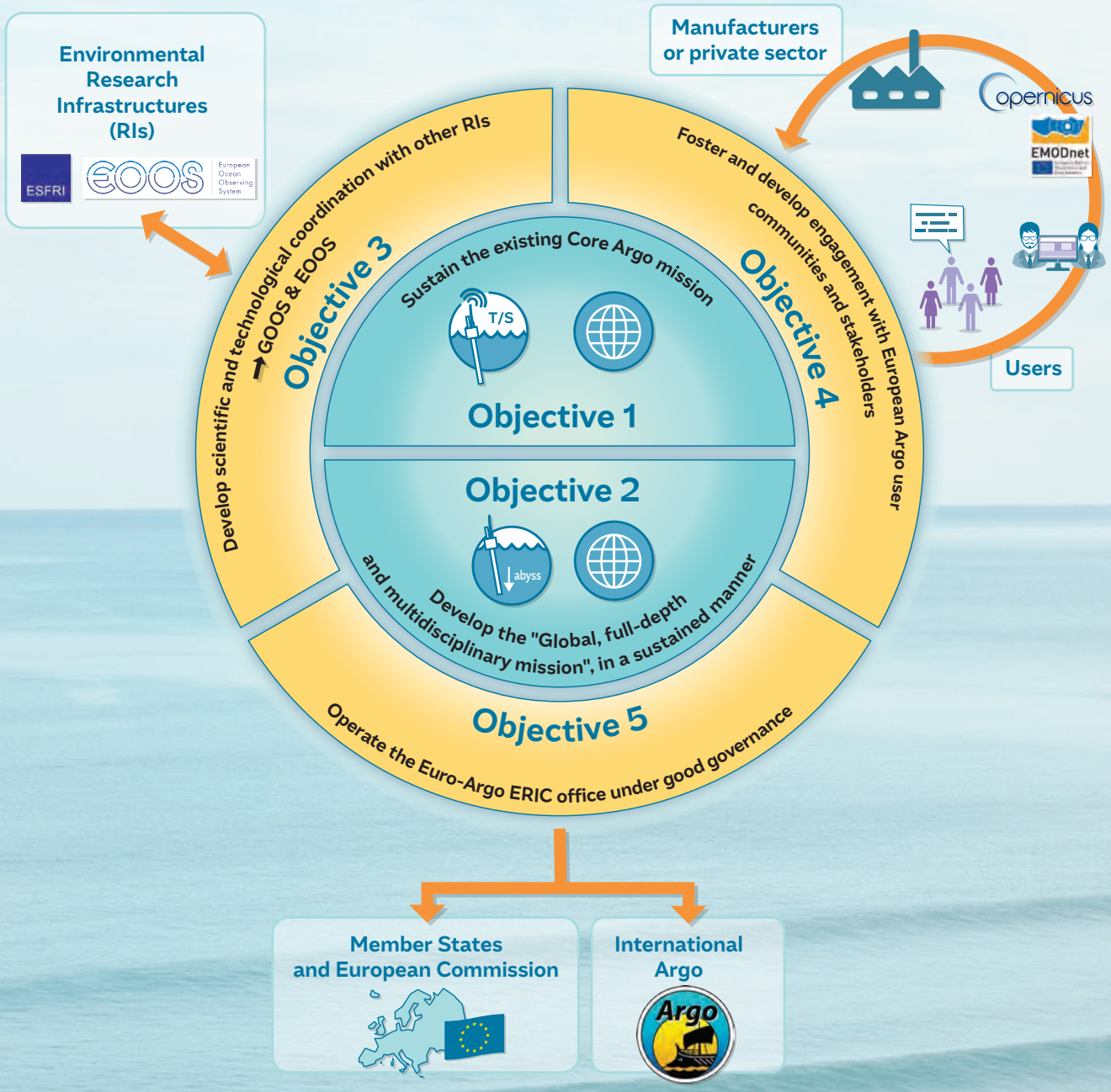

Figure 1: The five objectives of the new five-year plan and the involved partners.

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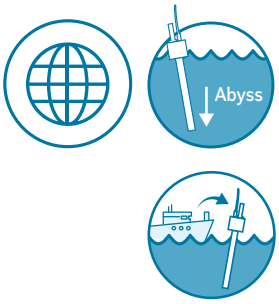
2 REVIEW OF 2019 ACTIVITIES

2019 has been an intense year, marked by the positive evaluation of the ERIC and many activities carried out in line with the 5 new objectives of the 5-year plan and carried on partnerships with Members and Observers.

Objective 1

Objective 2



SUSTAIN THE EXISTING CORE ARGO MISSION AND EXTEND THE EURO-ARGO CONTRIBUTION TO THE "GLOBAL, FULL-DEPTH AND MULTIDISCIPLINARY ARGO" DESIGN

Network implementation

→ 2019 Floats deployments

In 2019 Euro-Argo has deployed 190 floats, including one float donated by Spain to Morocco (not accounted for in Table 1). Table 1 shows the repartition of 2019 floats deployments by basins, by parameters measured (in orange) and types of floats (in blue). Numbers are compared to the strategy in the two lasts columns and raws. When the target is reached, the number of floats besides this target is indicated in a green cell. The geographical distribution of deployments is also shown, → see Figure 3 p. 11. The objective is to reach the number of 350 floats within 10 years, gradually increasing from 250 to 350 and integrating the new design (50 BGC and 50 DEEP floats per year).

Number of floats	Variables							Float types						
	T/S	O_2	Chla	suspended particles	Nitrate	downwelling irradiance	pH	core	BGC	BIO	Deep	Total	Target	GAP
Nordic Seas	22	8	6	6	3	6	3	14	3	3	2	22	15	+7
Mediterranean Sea	33	20	5	5	2	5	1	12	1	18	2	33	30	+3
Black Sea	4	1	0	0	0	0	0	3	0	1	0	4	5	- 1
Baltic Sea	4	3	0	0	0	0	0	1	0	3	na	4	4	0
Southern Ocean	5	0	0	0	0	0	0	5	0	0	0	5	25	- 20
Arctic Ocean	3	1	1	1	1	1	0	2	0	1	na	3		+3
Global Ocean without the specific regions above	118	11	8	8	0	6	2	107	0	11	0	118	271	- 153
Total	189	44	20	20	6	18	6	144	4	37	4	189	350	- 161
Target	350	176	50	50	50	50	50	250	50		50	350		
GAP	- 161	- 132	- 30	- 30	- 44	- 32	- 44	- 106	- 9		- 46	- 161		

Table 1: Euro-Argo float deployments in 2019, by variables measured (orange) and float types (blue). BGC stands for Biogeochemical floats (6 variables) & BIO stands for all Biogeochemical floats with only 1 to 5 variables. Cells in green show when the target is reached.

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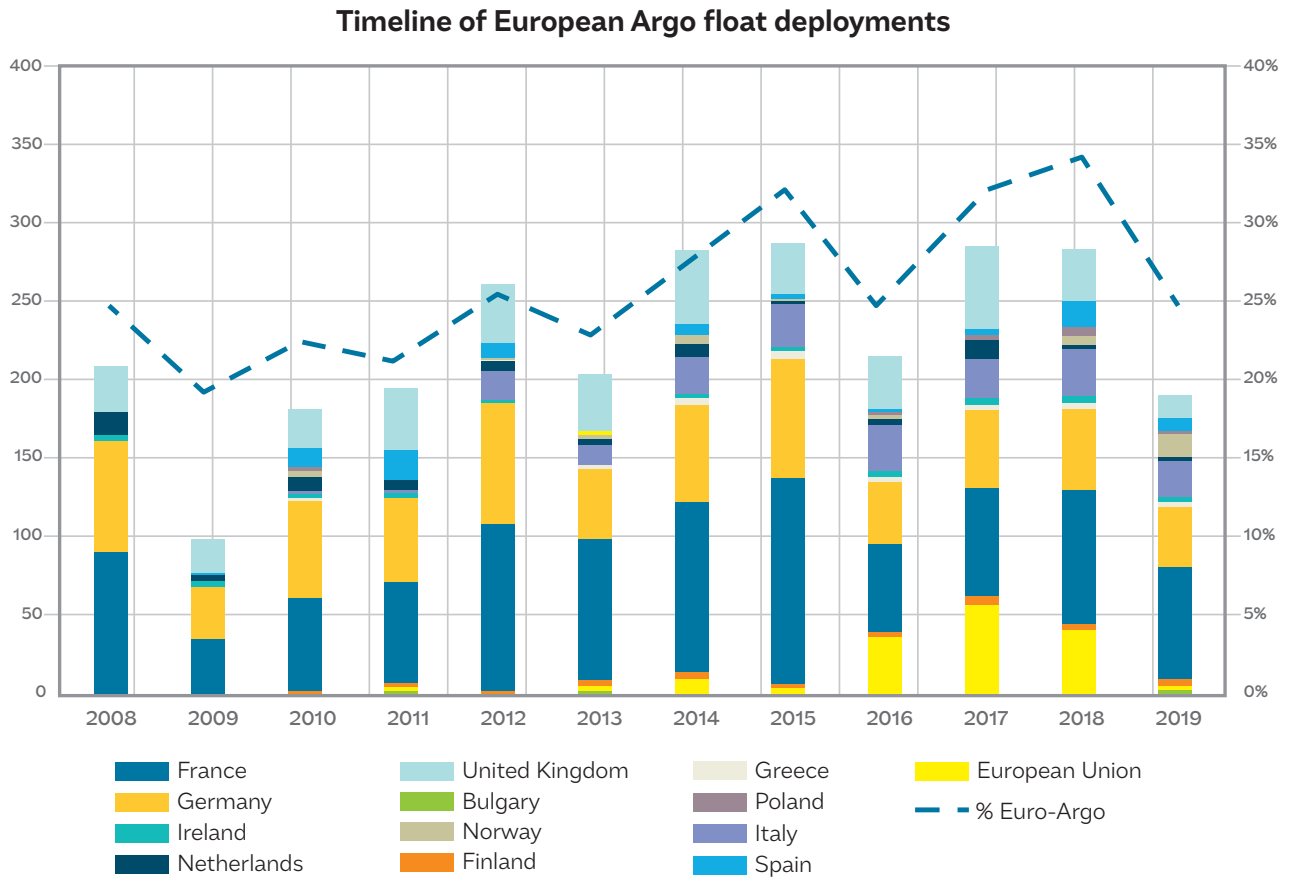

Figure 2: Timeline of European Argo float deployments showing the evolution of European float deployments in float number (colors, left axis) and as a percentage of the international effort (blue dashed line, right axis). © JCOMMOPS/AIC

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The number of floats deployed in 2019 is lower than the number of floats deployed last 2 years → Figure 2, mainly due to delays in deployments: the EU-funded floats encountered delays in float purchase, UK was impacted by the Seabird CTD recall (some floats missed their deployment opportunities due to repair/turnaround time) and France encountered technical issues during Deep float testing, that prevented the planned deployments.

The → Figure 3 shows the locations of 2019 deployments.

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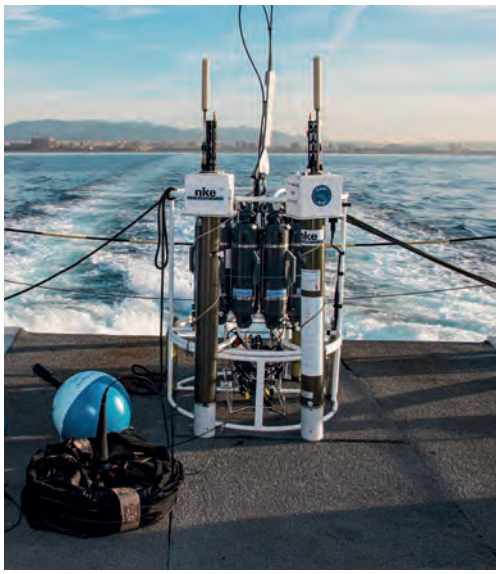

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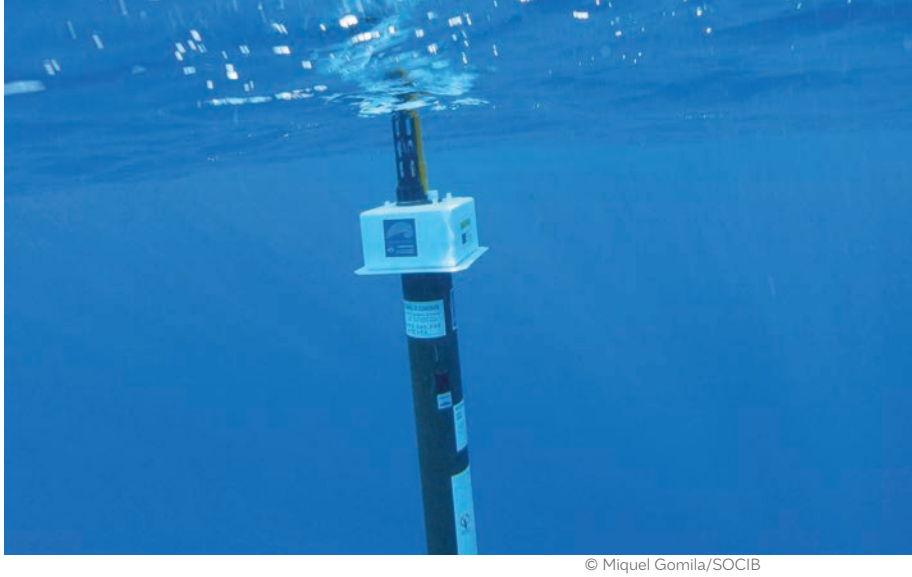
Float deployments by SOCIB in Mallorca.



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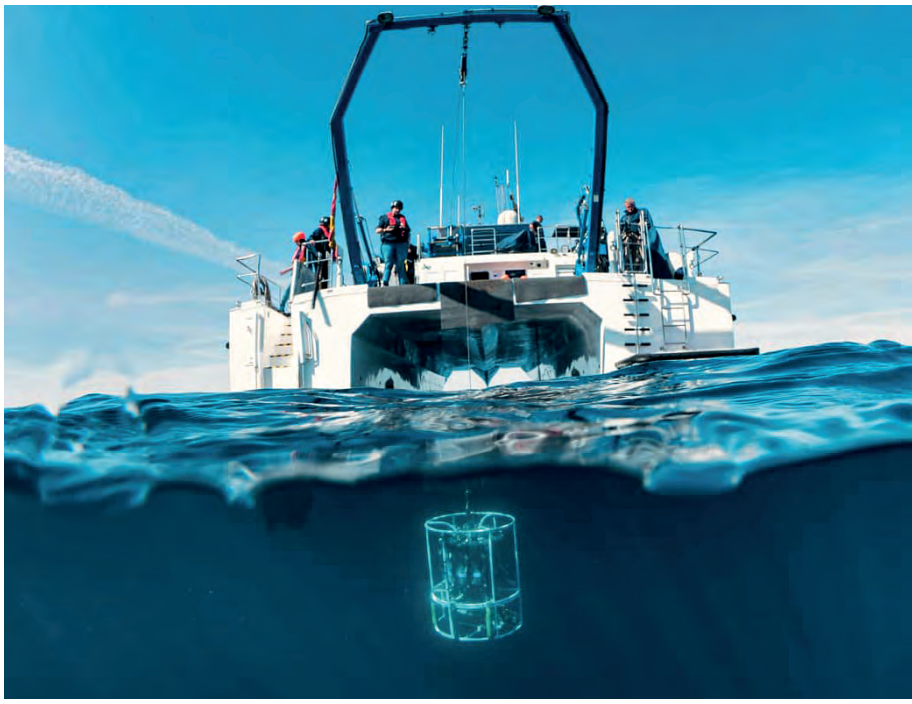

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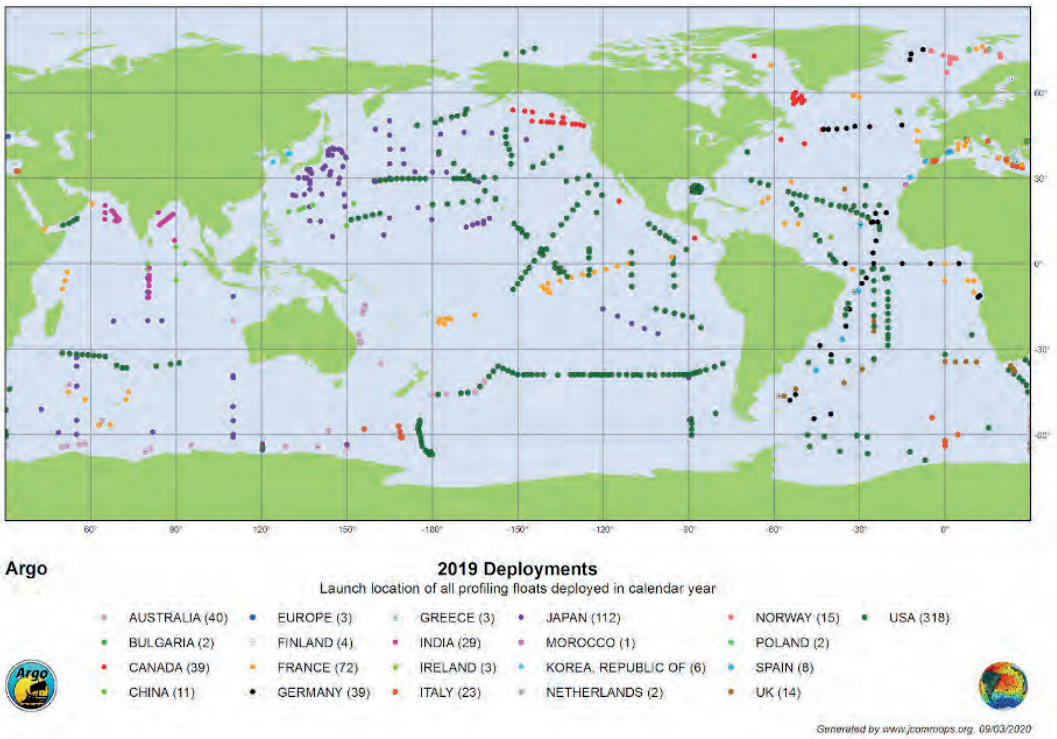
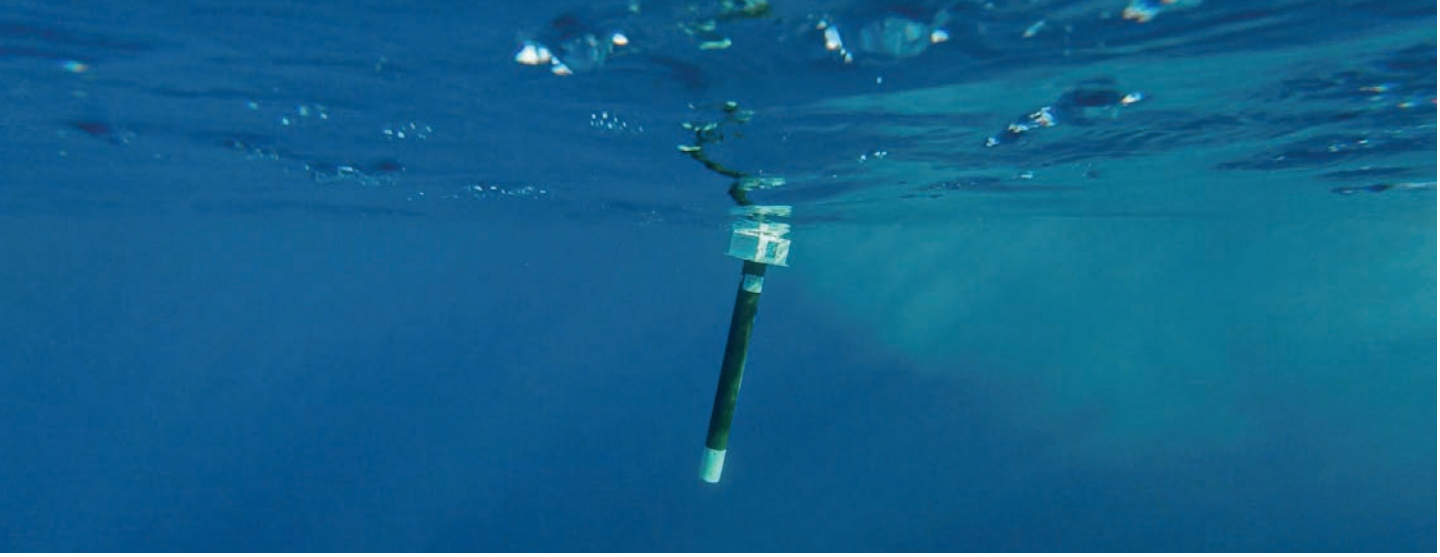


Figure 3: Argo 2019 deployments: 190 Euro-Argo floats (including one Moroccan) among the 745 deployed in 2019, representing 26% of the deployments. © JCOMMOPS/AIC



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→ 2019 Floats procurements

Since 2017 a service for float procurement is available for Euro-Argo partners. This concerns standard Temperature and Salinity (T/S) core Argo floats, as well as Deep floats. Options for Dissolved Oxygen (DO) measurements and Ice Sensing Algorithm (ISA) for deployments in high-latitude regions are also available. NKE float manufacturer is currently awarded (from the pluri-annual calls for tender set up in 2016 and 2017) for the framework agreements.

For floats purchased through this service, Euro-Argo Office technical team proposes to Members to deal with the inbounding logistics (follow-up of the manufacturing process, delivery dates, coordination of the telecommunication contracts opening), to handle the acceptance tests in the Ifremer testing facilities (sea-water basin for real profiling down to 20 metres, hyperbaric chamber for the Deep floats) and finally to ship the equipment either to the purchasing institutes, or directly to the deployment ports of call. Assistance for the handling of float metadata for the data centres, as well as "at-sea monitoring" is also offered.

In 2019, Euro-Argo purchased 62 floats for 6 countries and a total of about one million euros. The details are provided below in Table 2. Additionally, 5 oxygen floats have been purchased on the ERIC 2019 budget (following a council decision) for about one hundred thousand euros. These will be deployed in 2020, probably during a cruise departing from South Africa.

COUNTRY	Number of floats						
	Total	Core	Core + DO	Core + ISA	Core + DO + ISA	DEEP + DO	DEEP + DO + ISA
BULGARIA	3	1	2				
ERIC	6	1	5				
ITALY	42	16	10	14		2	
NETHERLANDS	2	2					
NORWAY	8			6			2
POLAND	3		1	1	1		
SPAIN	3	3					
Total	67 floats (~1.1 M€)						

Table 2: ERIC float procurement in 2019 (by country and float types), on behalf of Euro-Argo Members and Observers.

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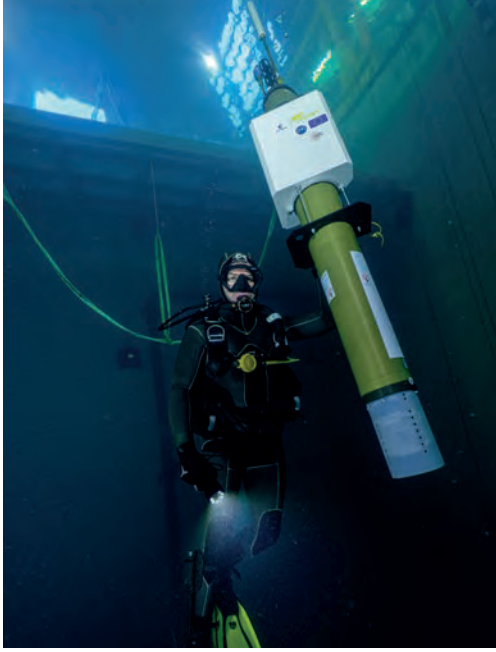

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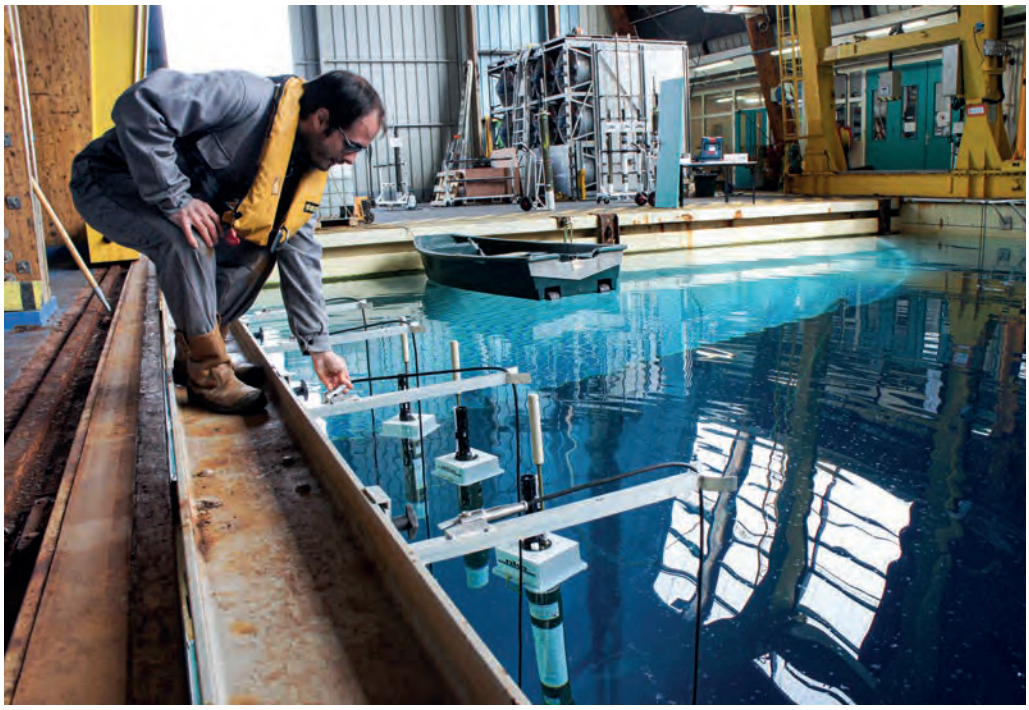
Technical developments

→ Tests of alternative sensors for measuring Argo parameters

One of the tasks of the Euro-Argo RISE project (see p. 28) is to test the low-cost nitrate OPUS sensor manufactured by TriOS on a float and to compare it with the standard BGC Argo nitrate sensor (the SUNA sensor manufactured by Seabird). The Nitrate OPUS sensor has been fully interfaced by the Laboratory of Villefranche (LOV), France with an NKE float (CTS5-Payload) and a SUNA sensor was clamped and only powered by the float. Two deployments were carried out in the Villefranche Bay and surrounding area with the OPUS together with the SUNA, in July and November 2019. Those two tests were fully successful and the data are now being processed for analysis.

In the perspective of diversifying CTD sensors available for Argo floats, Ifremer has conducted a study in collaboration with both the NKE Argo float manufacturer and the RBR sensor manufacturer to integrate the RBRargo³ sensor on Arvor floats. Activities carried out in 2019 included NKE developments to integrate either the RBR sensor or the classical SBE41 sensors on the same end cap, software developments, CTD end cap calibration by RBR and Pressure tank qualification by Ifremer.



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Romain Cancouët, Operational Engineer from the Euro-Argo Office, testing Argo floats in the Ifremer pool, Brest, France.

→ Ice Sensing Algorithms

An important work was performed by BSH with the collaboration of FMI and IO-PAN to build a reference dataset of hydrographic properties in seasonal ice-covered regions of the Northern Hemisphere. This dataset will then be used in order to better define the Ice Avoidance Algorithms thresholds to be implemented in floats softwares. The progress of this study is written in a living document that will be finalized in the form of a deliverable for Euro-Argo RISE (D5.1) end of 2021.

→ Fleet monitoring

The new tool developed in the MOCCA project → Figures 4 & 5 (and see p. 30) to help Argo operators to monitor their fleet from a technical point of view has been officially released in 2019. It was presented during the 7th Euro-Argo Science Meeting in October, in Athens (Greece) and during the 20th Argo Data Management Team (ADMT) meeting in Villefranche-sur-mer (France) and received very positive feedback from the Argo community.

▸ *https://fleetmonitoring.euro-argo.eu/dashboard*

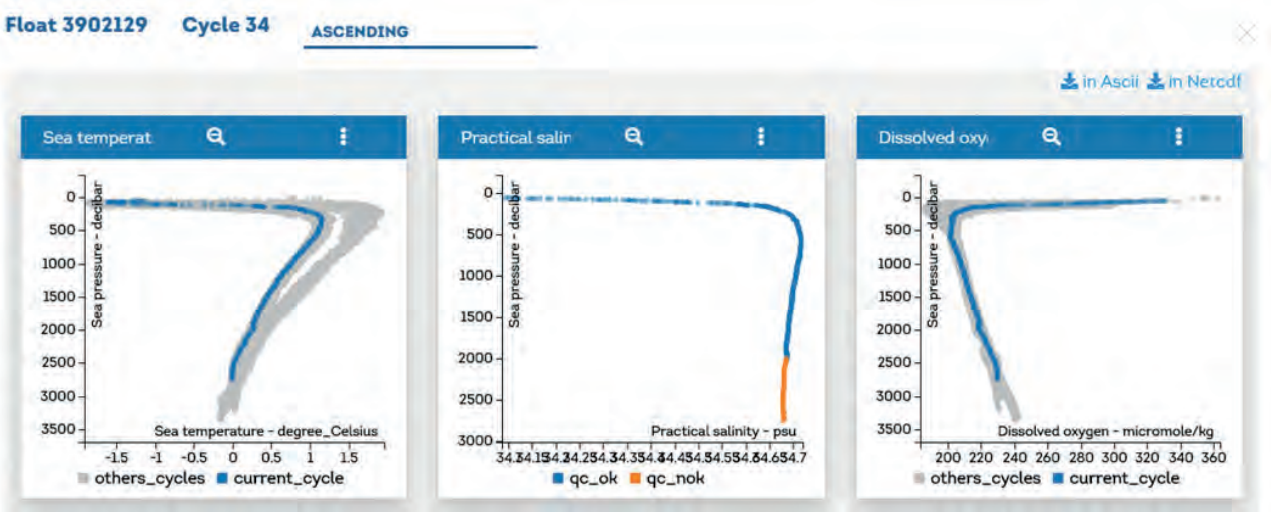

Figure 4: Display of Temperature, Salinity and Dissolved Oxygen profiles for a particular cycle of Deep Argo float WMO 3902129. Data are represented as a function of pressure, and colour-coded according to quality flags (blue/orange). Data collected from all other cycles may be superposed (grey).

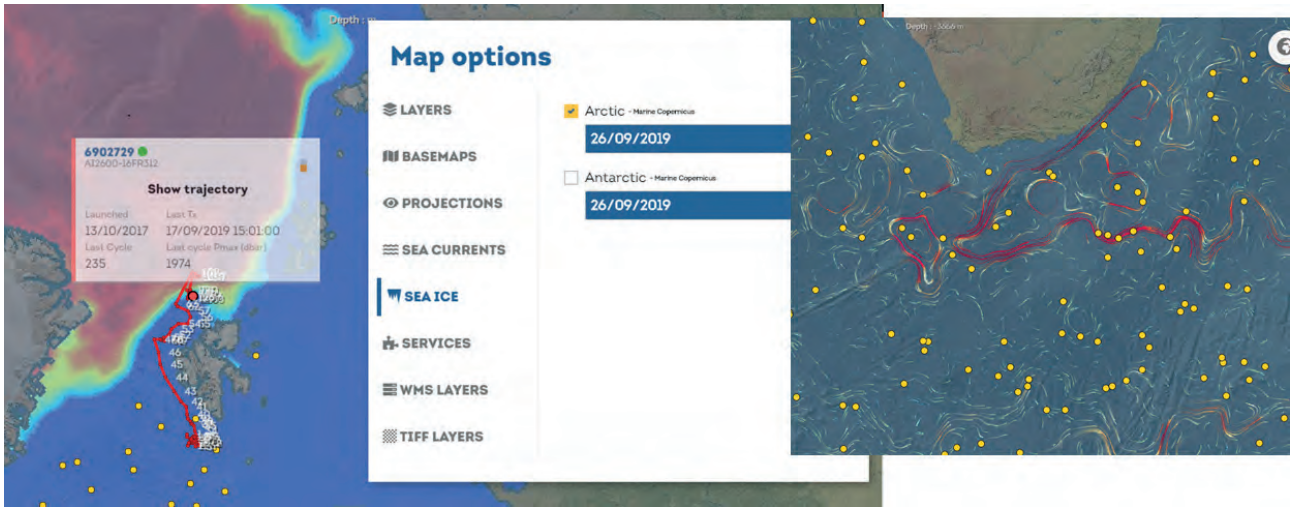

Figure 5: Visualisation of Argo float trajectory on the map section. Contextual datasets such as bathymetry (GEBCO, EMODnet), daily Arctic and Antarctic sea ice concentrations (CMEMS) or sea currents (surface: AVISO; deep: ANDRO Argo-based deep displacement dataset) can be overlaid.

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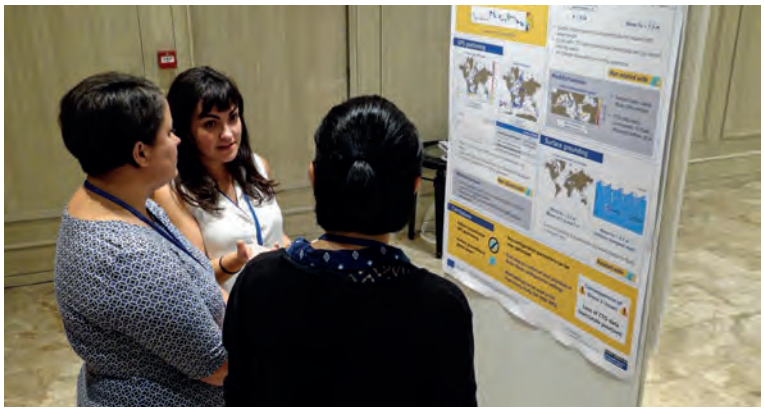
→ Andrea García Juan's work

Hired in late 2018 at the ERIC Office, Andrea García Juan continued to work in 2019 on Argo data and at-sea monitoring activities. In the framework of the MOCCA project (see p. 30), she developed tools aiming to capture the results of the Delayed-Mode Quality Control (DMQC). Her findings lead to the update of some real-time data processing procedures and associated documentation. She also contributed to an international paper on Argo data and to a study on Agulhas Western Boundary Current, where high-resolution Argo profiling floats were deployed during MOCCA project.

Andrea was deeply involved in "at-sea monitoring" activities. She performed an investigation on possible relationships between weather conditions and floats behaviour and performances (data transmission, positioning, etc.). She analyzed and refined the alerts implemented in the fleet monitoring tool to warn Argo operators on unexpected technical behaviour of their floats. In the context of sustaining the existing global array via the increase of floats' lifetime, Andrea undertook several studies that will be further expanded in the Euro-Argo RISE project (see p. 28). She examined floats configurations and their possible optimization to try to maximize the life expectancy of Argo floats, she computed survival rates of floats with different configuration (especially regarding parameters that could impact battery consumption). All the material, scripts and diagnostic plots will be available to the wider Argo community and compiled in a toolbox.

Andrea paved the way for the enrichments of monitoring tools and best practices recommendations to increase the overall life expectancy of Argo floats. We would like to thank her for the great amount of work that she has accomplished and wish her every success in the future, hopefully not too far from the Argo world!



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Data management

Europe hosts 1 of the 2 Argo Global Data Assembly Centres (GDAC): Coriolis/Ifremer, in France, and 2 of the 11 Argo Data Assembly Centres (DAC): Coriolis/Ifremer, and BODC in the UK. In 2019, 62 809 Argo data profiles have been processed by these two centres → Figure 6. DMQC of the European floats are performed by 4 institutes (BSH, OGS, Coriolis/Ifremer and BODC) and nearly 75% of the European floats have been scientifically assessed.

In addition to the data processing itself, both Ifremer and BODC have been able to make progress in different aspects of Argo data management, in the framework of the MOCCA, Euro-Argo RISE and ENVRI-FAIR EU projects.

A survey was issued by BODC to assess Delayed Mode Quality Control (DMQC) methods for Argo data at international level and helped improving the way DMQC is performed. Results of the survey led to the development of a python version of the commonly used OWC method (coded in Matlab). In terms of Real Time Quality Control (RTQC), a new method based on the use of a Min-Max climatology developed by OceanScope has been implemented in near-real time at Coriolis GDAC. At last ADMT meeting, an improvement of the spike test has been proposed by Ifremer. The proposal was endorsed by ADMT and is under implementation in all DACs. With the aim of improving Argo metadata quality and FAIRness of the Argo data, work has started within ENVRI-FAIR project at BODC to use the NERSC Vocabulary Server to provide Machine readable access to all the reference tables described in the Argo User's Manual.

Regarding management of Biogeochemical (BGC) Argo data, work has started both for improving methods of Quality Control (QC) and for the organization of the Data flow at European level, activity fostered within Euro-Argo RISE project.

Activities have also been carried out at Argo Regional Centres (ARCs) level, such as data consistency checks, data products creation, first version of a DMQC cookbook (NA-ARC), identification and analysis of early failure of some Seabird CTD, improvement of the reference database used for DMQC, DMQC training of IO-BAS personnel by OGS (Med-ARC) and characterization of profiles by hydrography (SO-ARC).
Finally, a github repository (github.com/euroargodev) has been created to centralize all existing tools used in Argo data management (Quality Control, data access, visualization, etc.) in a common repository open to everyone.

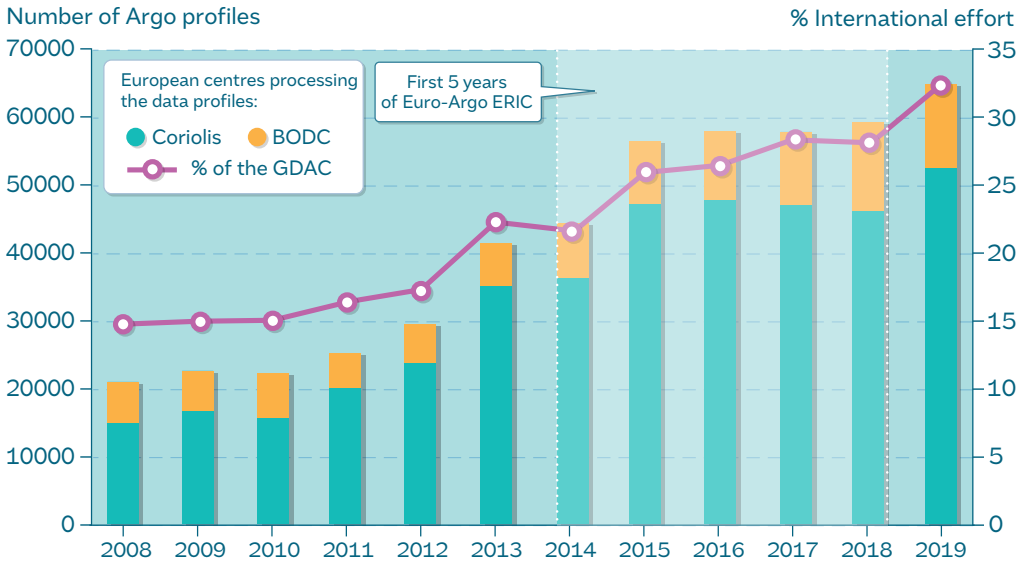


Figure 6: Argo data profiles available on Coriolis and BODC DACs: in number of profiles (left axis, blue: Coriolis and orange: BODC) and in percentage of the total number of profiles available on the GDAC (right axis).

KPIs regarding users and publications

→ Number of operational floats

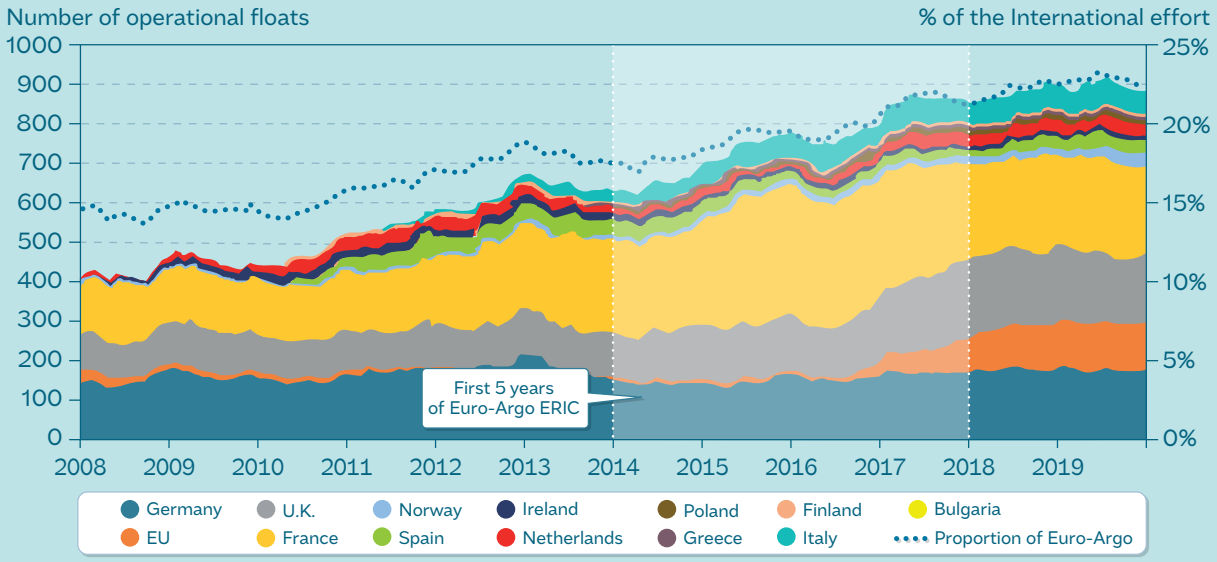


Figure 7: Evolution of the European contribution to the Argo network in number of operational floats (colour, left axis) and in percentage of the international effort (blue dashed line, right axis). © JCOMMOPS/AIC

→ Number of floats reaching the 50 or 100 cycles target

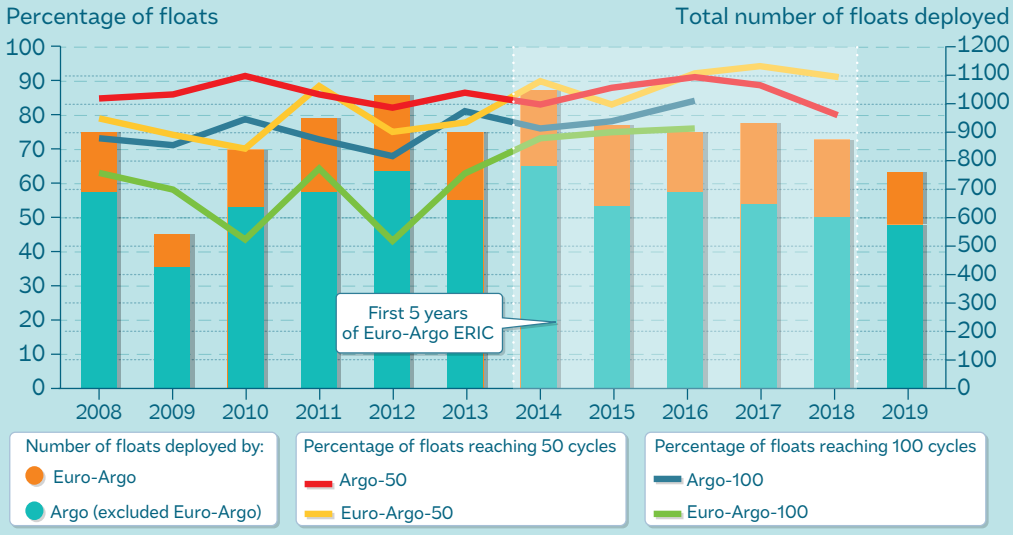


Figure 8: Percentage of floats reaching the 50 or 100 cycles target compared to the Argo fleet (coloured lines, left axis) and total number of floats deployed (right axis). After the MOCCA project, the deployment rate of Euro-Argo floats decreased to around 25% (compared to 30% in 2017 and 2018), close to that of operational floats. © JCOMMOPS/AIC

→ Number of floats per manufacturer

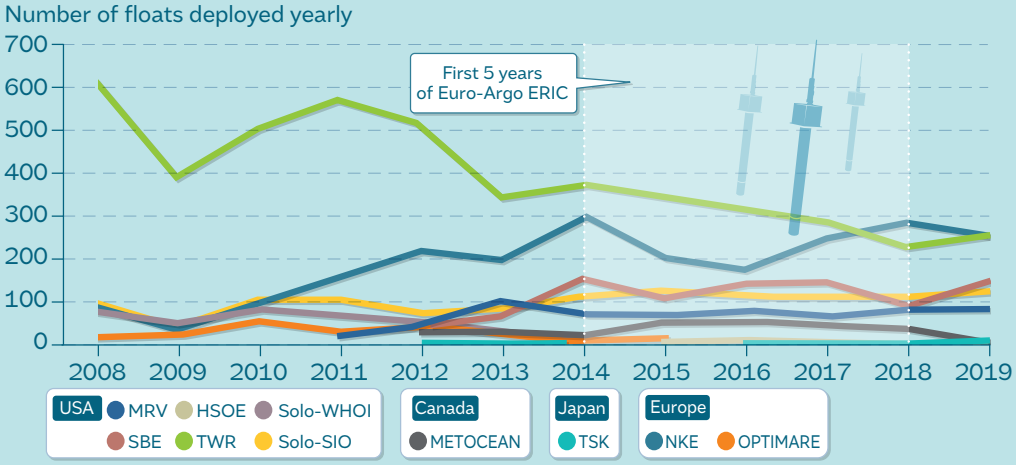
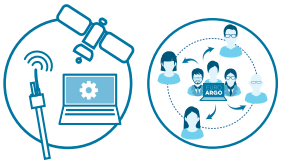


Figure 9: Evolution of number of floats deployed per year, grouped by float manufacturer.

© crédit photo

EuroGoos General Assembly, in May 2019.

Objective 3



CONTRIBUTE TO A GLOBAL OCEAN OBSERVING SYSTEM

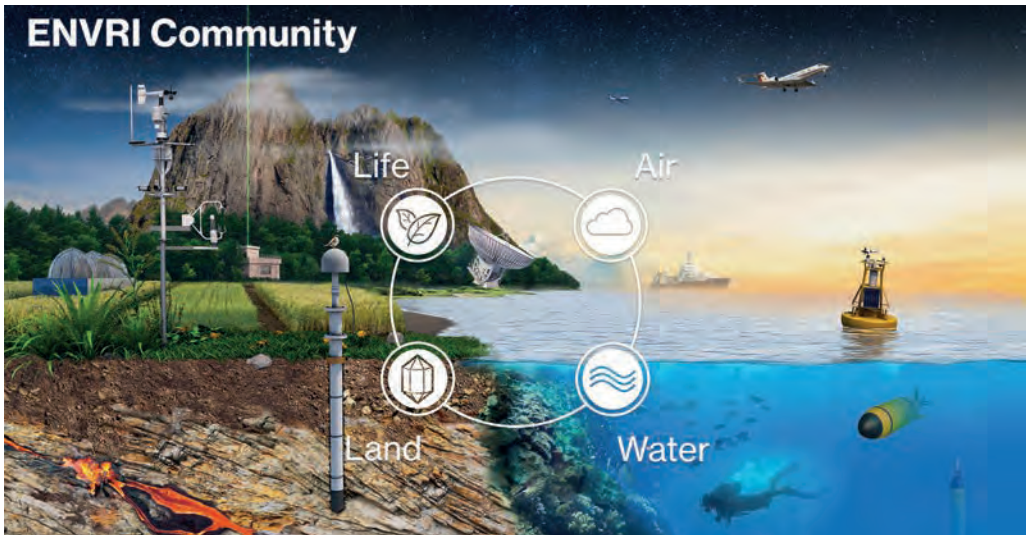
Euro-Argo is evolving in link with many different actors in the ocean observing community, at regional, European and international levels.

In November 2019, Euro-Argo attended a European Global Ocean Observing System (EuroGOOS) integration workshop organized in the context of the new EuroGOOS strategy and developments at GOOS and IOC level (primarily planning for the Ocean Decade). For Euro-Argo, this experience was beneficial to foster the link with other observing networks operated in the EuroGOOS Regional Ocean Observing System (ROOSs; multi-platform observing system design, joint activities, link with manufacturers for sensors development, etc.) and also the link with the coastal operational users represented in the ROOSs.

At regional scale, Euro-Argo was invited to participate to the SUST-BLACK Conference in Bucarest (Romania), in May 2019. During this event, organized jointly by the Romanian Presidency of the European Union, the European Commission and the GeoEcoMar institute, high level discussions were held between all the regional and abroad forces on the perspectives for a sustainable development of the Black Sea.

All year long, Euro-Argo has continued its activities at European level with the ENVRI community through its participation to the Board of European Environmental Research Infrastructures (BEERI), and to the ENVRI common booth at EGU2019 (April, Vienna). This year also saw the end of the ENVRIplus H2020 project (see p. 32) and the start of its follow-up, the ENVRI-FAIR H2020 project, focused on the data aspects of Environmental Research Infrastructures (see p. 33) and through which the BEERI activities are continuing.

The AtlantOS EU-H2020 project (see p. 34) ended in 2019, and laid the foundations for a basin-scale contribution to the Global Ocean Observing System (GOOS): AtlantOS the program. A vision for this All-Atlantic Ocean Observing System in 2030 has been published in 2019 in which Euro-Argo contributed. As a conclusion to the AtlantOS H2020 project, success stories on the form of videos were published, one showing Argo as a successful example for moving towards an Integrated All-Atlantic Ocean Observing System in 2030, with the enhancement of deep and biogeochemical measurements in the Atlantic.



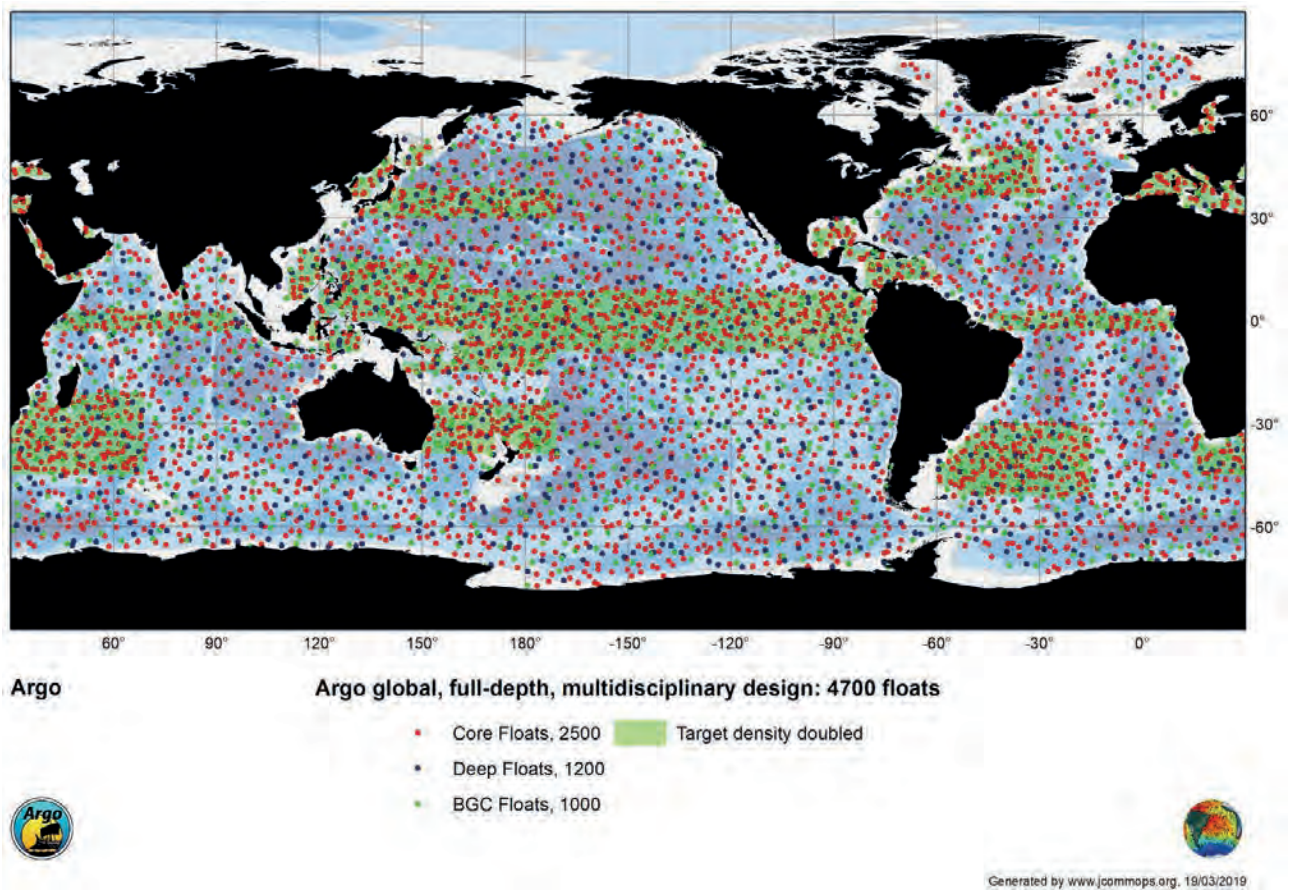


Figure 10: New Argo design approved during AST20 meeting (Hangzhou, March 2019).

A new EU-H2020 project in which Euro-Argo is involved started in 2019 in the continuity of AtlantOS with the aim of improving and integrating European ocean observing and forecasting systems for sustainable use of the oceans: EuroSea (see p. 35).

The OceanObs'19 Conference was an important event of 2019 that gathered more than a thousand participants from 74 countries in Hawaii. The design of the programme and the conference statement was based on more than 150 Community White Papers. A poster was presented by Euro-Argo, who also contributed to 2 White Papers: Danobeitia et al. (2020) on European Marine Research Infrastructures for Ocean Observations and Roemmich et al. (2019) on the Future of Argo (international). The latest presents the design of the new phase of Argo: a "Global, full-depth, multi-disciplinary Argo" array, as officially agreed during the 20th Argo Steering Team meeting in Hangzhou (China) in March 2019. The new phase of Argo acknowledges the inclusion of the former Deep Argo and BGC Argo pilot missions in a unique Argo mission, with a common design → Figure 10.

© AST

The 20th Argo Steering Team (AST) Meeting, 11–15 March, Hangzhou China.

7th Euro-Argo Science Meeting in Athens

© Francine Loubrieu/Euro-Argo ERIC

Objective 4

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

Major events

Euro-Argo organised the 7th Euro-Argo Science Meeting in Athens, Greece, on October 22nd – 23rd, as part of the Euro-Argo RISE project (Deliverable 7.3: meeting report) and with the help of HCMR. This meeting brought together 69 scientists from 17 countries and provided an opportunity for high-level science interactions in link with Argo. New features were proposed to increase interactivity and liveliness, such as a vote and awards for the best poster and best talk, and live demos of Argo tools during poster sessions. An online tool was also used (Slido) to enable participants to interact with speakers in a different way and for the organisers to get feedback from the participants.

In 2019, Euro-Argo attended the CMEMS General Assembly, a nice opportunity to interact with several of the major Euro-Argo user communities (CMEMS community but also EMODnet representatives). The Euro-Argo ERIC was also represented at various regional meeting such as Mon-GOOS and BOOS annual meetings, as well as the IX International Forum "Arctic: Today and the Future" held in Russia, a way to approach new communities around regional issues.

Cooperation through float deployments is another concrete way to involve new Argo partners. This year, a Spanish float was donated to Morocco, thus allowing

© Alberto González Santana/IEO

A Spanish Argo float was donated from Instituto Español de Oceanografía (IEO) to the Moroccan Institut National de Recherche Halieutique (INRH). The float was deployed jointly by scientists from IEO and INRH during the RAPROCAN1911 cruise, between the Canary Islands and Morocco.

Morocco to officially enter into the international Argo programme. Similarly, the first float funded under Euro-Argo RISE was deployed in the Black Sea thanks to a collaboration between Romania (GeoEcoMar), Bulgaria (IO-BAS) & Italy (OGS).

In September 2019, France hosted the G7 summit. In that context, the G7 head of parliament meeting was organised in Brest, including a visit of Ifremer's premises. During this visit, the new Argo design and the need to raise funds to achieve it, as well as the importance of the European contribution to the Argo international programme was highlighted. This event followed a visit of the Group of Senior Officials (GSO) on global Research Infrastructures of G7 who coordinates Research Infrastructures at Global scale, in June, where the Euro-Argo ERIC and its contribution to the Argo global network was also presented together with the French Research fleet and the Concordia Antarctic station, as well as the European Marine Biological Resource Centre ERIC (EMBRC ERIC).

EVENTS	DATES
Forum Arctic	5 – 7 December
MoonGOOS	3 – 5 December
Kick-off EuroSea	27 – 29 November
EuroGOOS integration workshop	19 – 20 November
7th Euro-Argo Science Meeting	22 – 23 October
ADMT20	13 – 18 October
OceanObs'19	16 – 20 September
Euro-Argo ERIC evaluation	24 – 27 June
BOOS annual meeting	12 – 13 June
NOC open days	8 June
CMEMS GA	20 – 24 May
Deep Argo workshop	13 – 17 May
SUST-BLACK conference	8 – 11 May
51st Colloquium on Ocean Dynamics Liege	6 – 9 May
EuroGOOS GA	8 – 9 May
ERIC Forum	7 – 8 May
EGU	7 – 12 April
AtlantOS symposium	25 – 28 March
Final ENVRI week	25 – 29 Mar
AST20	11 – 15 Mar
ENVRI-FAIR kick-off	14 – 16 Jan
Euro-Argo RISE kick-off	9 – 11 Jan

Table 3: Events where Euro-Argo was present in 2019.

Guillaume Maze (Argo-France) presents the Argo Programme to the G7 delegates, in Ifremer premises.

© flashmovie/Adobe Stock

Euro-Argo Twitter account.

1st Euro-Argo press release to announce the 7th Euro-Argo Science meeting.

Communication activities and tools

Activities aiming at increasing Euro-Argo visibility were pursued in 2019, through 42 news published along the year on Euro-Argo website, and sent to a large audience in two News Briefs campaign (July and December). The Twitter account continued to gain new followers → Figure 12, a LinkedIn account was created, and a Press Release was published on the 7th Euro-Argo Science meeting.

Euro-Argo capacity in communicating with different audiences has been enhanced since Autumn 2019 with the arrival of Marine Bollard, Euro-Argo ERIC new communication officer. Marine leaded the editing and publication of the three major documents coming out of Euro-Argo 5-year internal evaluation (see p. 38).

Euro-Argo continued its activities with the Ocean Observers educational community initiated with JCOMMOPS in 2017 (2 teleconference meetings of the Ocean Observers international Working Group were held), and has been involved in a new Argo international Communication Group which came out of the Argo visualization "do-a-thon" workshop organised as a side event of the Argo Data Management Team 2019 annual meeting (October 2019).

Objective 5

OPERATE THE EURO-ARGO ERIC OFFICE UNDER GOOD GOVERNANCE

KPIs regarding users

→ Data access in average

561 VISITORS PER MONTH (AVERAGE)

4302 SESSIONS

5.9 TERABYTES OF DATA FILES DOWNLOADED

→ Number of publications

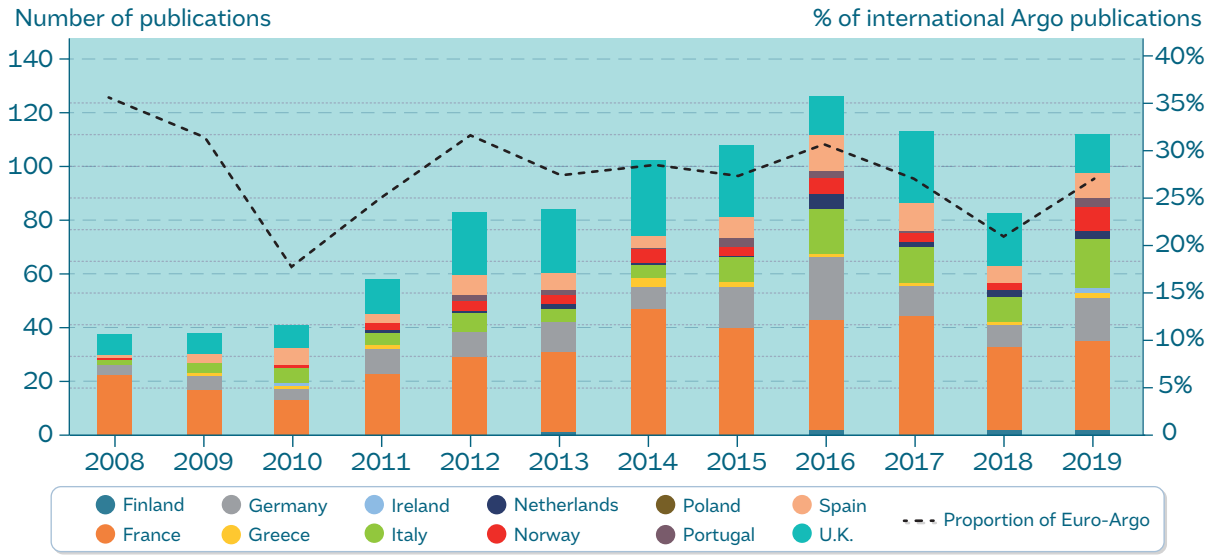


Figure 11: Euro-Argo publications per year (defined as publications mentioning Argo with first author's affiliation in a European country) in number of publications (left axis) and in percentage of the international Argo publications (right axis).

→ Number of Twitter followers

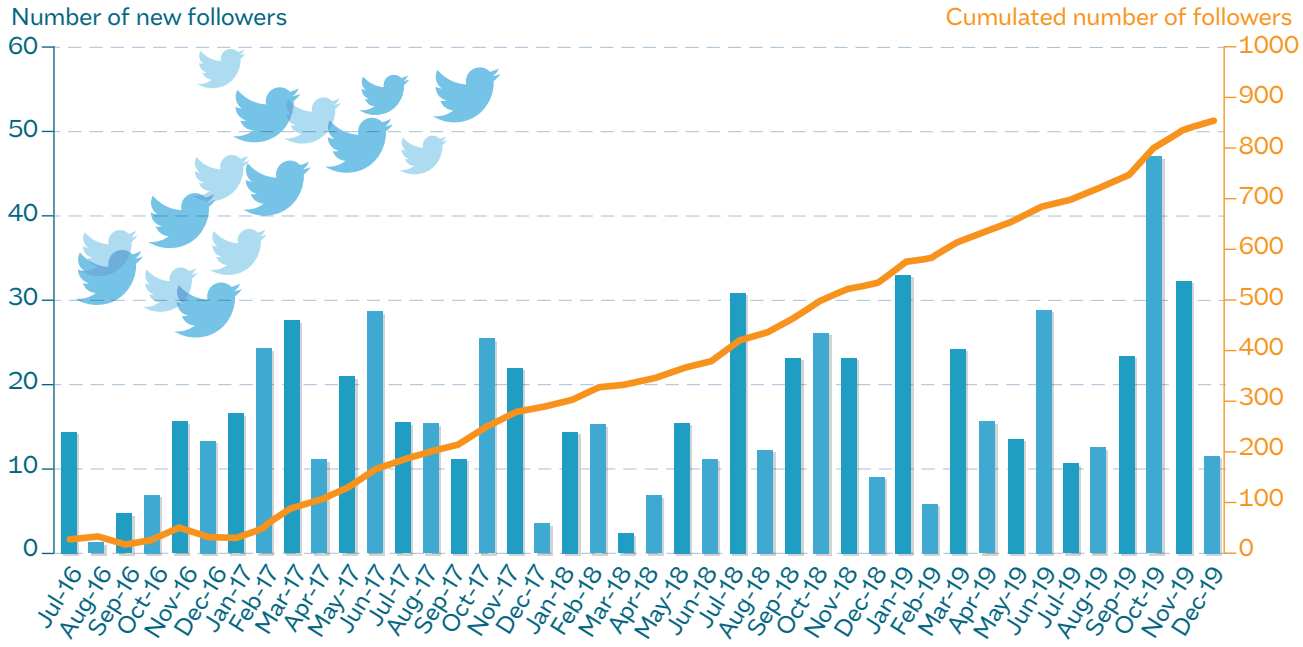


Figure 12: Evolution of the number of new (left axis, in blue) and cumulated (right axis, in orange) followers of the Euro-Argo Twitter account.

Main operational outcomes in 2019

The main operational outcome of this year was the first Euro-Argo ERIC internal evaluation, that was successfully conducted from the development and writing of the past five-year report and plan for the next 5 years to the publication of the associated documents, through the evaluation week in June (see p. 38). 2019 also saw the end of two H2020 projects where Euro-Argo was involved: AtlantOS and ENVRIplus, and the launch of four new H2020 projects: ENVRI-FAIR, EuroSea, ERIC-Forum and Euro-Argo RISE (see p. 26).

Management of the Euro-Argo ERIC

Two Management Board and two Council meetings were held → Table 4. Euro-Argo progress and status were presented at the 20th Argo Steering Team (AST) meeting in Hangzhou, China, in March and at the 20th Argo Data Management Team (ADMT) meeting in Villefranche-sur-mer, France, in October.

Event	Date
15th Management Board meeting	February 2019, Hamburg - Germany
11th Council meeting	June 2019, Brest - France
16th Management Board meeting	November 2019, Brest - France
12th Council meeting	December 2019, Paris - France

Table 4 : Euro-Argo Management Board and Council meetings in 2019.

The 16th Management Board meeting in Brest, France, in November.

© Antoine Poteau/LOV

The 20th Argo Data Management Team meeting in Villefranche-sur-mer, France, in October.

© Thomas Jessin/IMEV-LOV

→ Euro-Argo ERIC Office team: two new persons

→ Estérine Evrard

In order to help the ERIC Office team to fulfill its commitments in various EU projects, Euro-Argo has hired two new persons in 2019.

Estérine Evrard joined the office team in April, to assist the Euro-Argo RISE coordinator on a daily basis: her tasks include administrative, organizational and financial aspects. Besides this coordination aspect in the Euro-Argo RISE project, Estérine also works on activities in the workpackages in which Euro-Argo is involved (mainly WP7 on Euro-Argo visibility and services to users & WP8 on links with outside stakeholders and Euro-Argo strategy and sustainability). Estérine has been working in the field of marine environment since 9 years. She holds a PhD in Marine Biology from University of Brest.

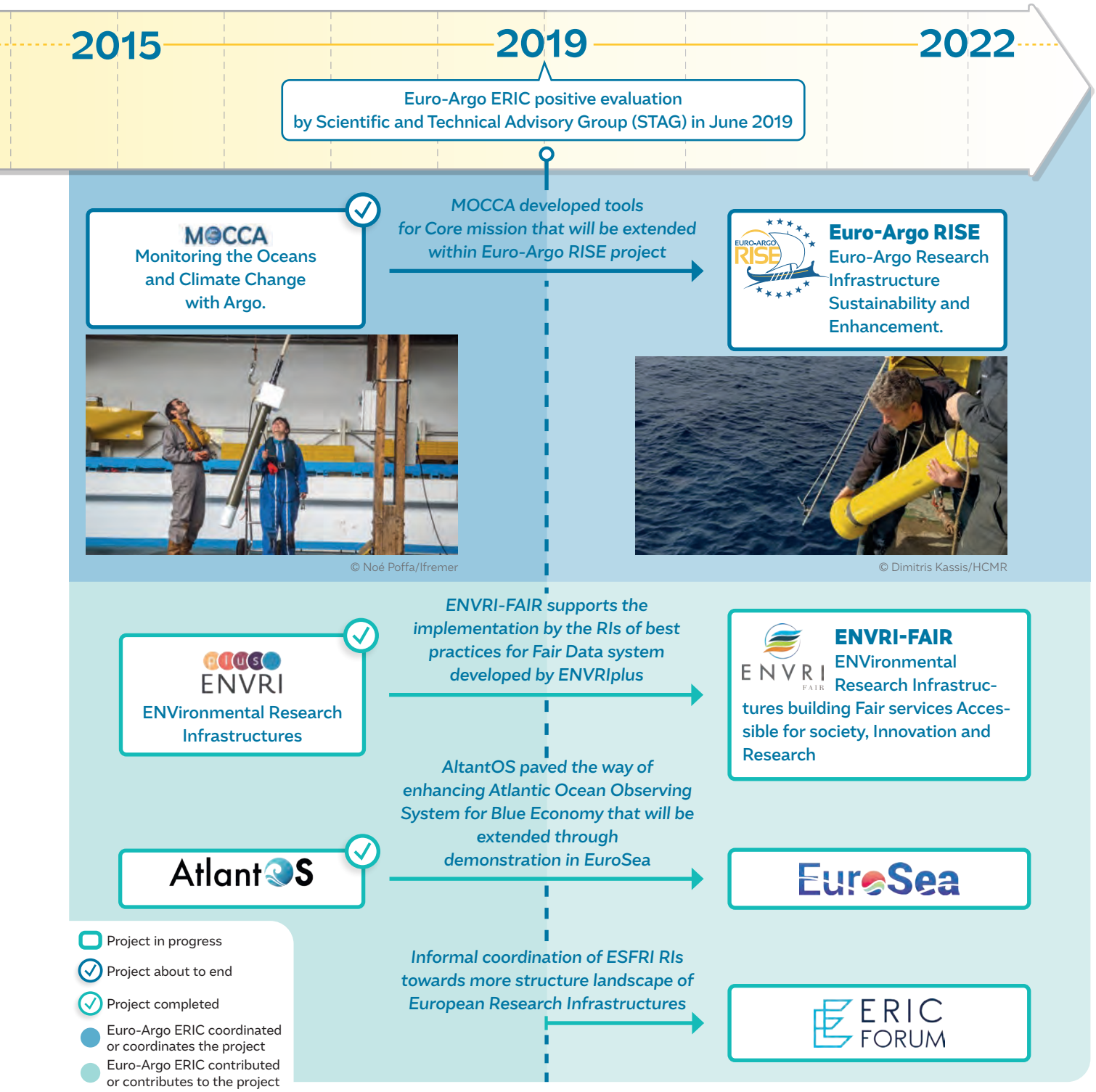
She first worked in analytical chemistry laboratory to measure organic pollutants in various matrices. Then, she gained experience in scientific projects by working 5 years in Cedre, an international expert in accidental water pollution and 3 years in Le Floch Dépollution, a specialized company in oil spill response. Over European and regional projects, she developed skills such as management, working with scientists, stakeholders and operational teams.

→ Marine Bollard

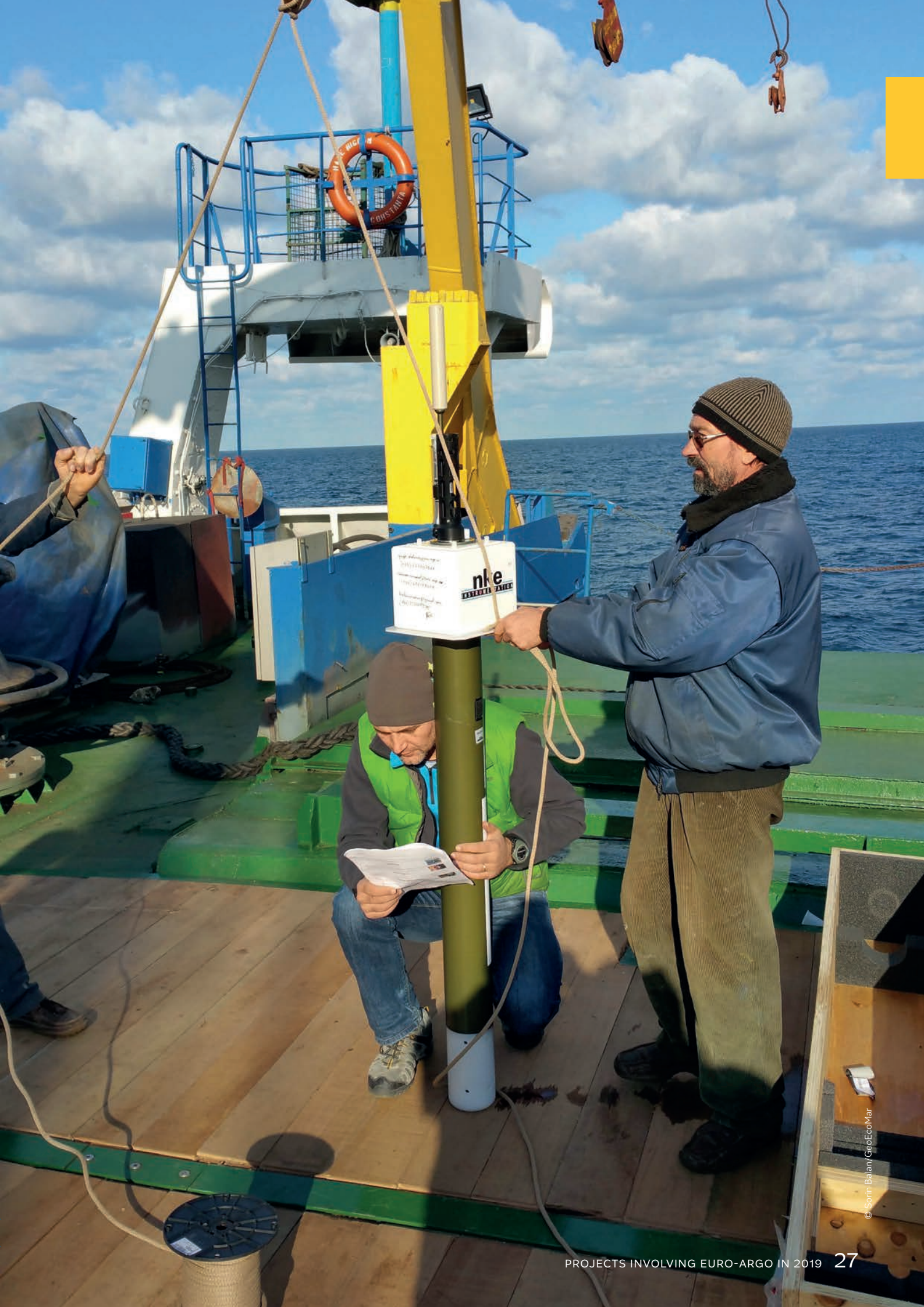
Marine Bollard started working at the ERIC office in September, as communication officer. Her first task was to supervise the editing and publication of the two documents written for the Euro-Argo ERIC 5-year internal evaluation, and the creation of a brochure summarizing these documents (see p. 39). Marine has also started to undertake the dissemination of the MOCCA project in its final year, through the production of different communication material (brochure, video, etc.). More generally, Marine is responsible for the communication and outreach activities of the Euro-Argo ERIC, and in charge of promoting the infrastructure's mission and services. Marine is double-hatted: she holds a Master's degree in Hydrogeology engineering from École nationale supérieure de géologie (Nancy, France) and a Master's degree in science journalism from École supérieure de journalisme (Lille, France). Marine has several years of experience in scientific journalism and scientific educational book publication.

3 PROJECTS INVOLVING EURO-ARGO IN 2019

In 2019, Euro-Argo was involved in 7 projects. It coordinated two of them (Euro-Argo RISE and MOCCA) and contributed to five of them (ENVRIplus, ENVRI-FAIR, Atlantos, EuroSea and ERIC-Forum), thanks to dedicated work packages. This year was also marked by the end of ENVRIplus project and the launch of ERIC-Forum.



Float deployment by GeoEcoMar team.



© Sorin Balan/GeoEcoMar

EURO-ARGO RISE

EURO-ARGO RESEARCH INFRASTRUCTURE SUSTAINABILITY AND ENHANCEMENT

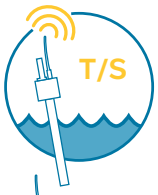
The Euro-Argo RISE project will enhance and extend the European capacity of the Argo network to provide essential ocean observations to better answer societal and scientific challenges. To reach this goal, it enhances and organizes the new EU Argo observations towards biogeochemistry, greater depth, ice-covered and shallower water regions. In addition, Euro-Argo RISE allows Europe to develop its contribution to Argo in the long-term, engaging with new teams and developing a sustainability plan with the Member States and the funding agencies.

https://www.euro-argo.eu/EU-Projects/Euro-Argo-RISE-2019-2022

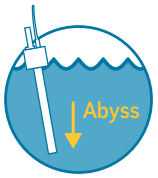
WORK PACKAGES

The Euro-Argo RISE project is organized in 8 work packages that allow the project to progress along Euro-Argo 5-year plan objectives.

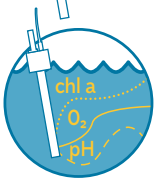
WP1
Project Management



WP2
Improvement of the Core Argo mission



WP3
Extension to deep ocean



WP4
Extension to biogeochemical parameters

MAIN ACHIEVEMENTS IN 2019

Euro-Argo RISE work is progressing according to schedule: the 5 Deliverables and 4 Milestones due by the end of 2019 have been released (out of 63 Deliverables in total). Here is a summary of the results achieved during the first year of the project.

TECHNOLOGICAL PROGRESS

About deployments

In October, the 1st Euro-Argo RISE float (WMO 6903271) was successfully deployed in the Black Sea thanks to fruitful tripartite collaboration between Romania (GeoEcoMar), Bulgaria (IO-BAS) and Italy (OGS). It has started to show interesting results on the way to operate floats in coastal areas.

In December, the 2nd Euro-Argo RISE float (WMO 6902899) was deployed by the LOV in the Ligurian Sea, with specific cycling parameters to investigate the potential of profiling floats in shelf areas.

Deployment of the 1st Euro-Argo RISE float from the Romanian R/V Mare Nigrum vessel - Black Sea, October 2019

© Vasile-Sorin Balan/GeoEcoMar

About prototypes

Technical specifications of Arvor-I-RBR profiling float, equipped with an RBR*argo*^{3} CTD were defined in 2019. Tests are planned in 2020 at Ifremer's test pool.

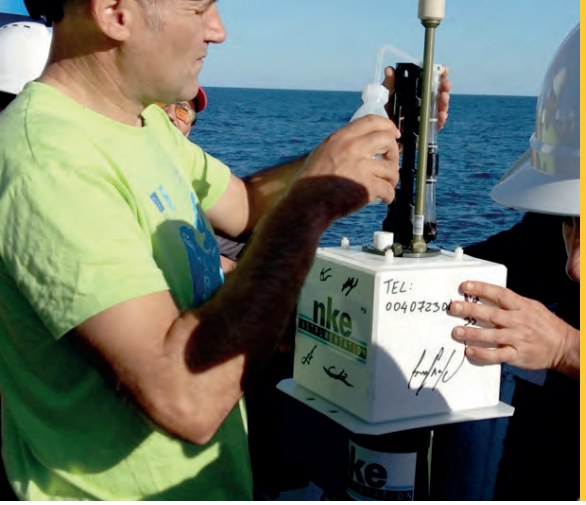
Specifications for the design of floats equipped with RBRconcerto^3 CTD (deep sensor) together with SBE41 and SBE61 sensors (2-head and 3-head floats) were determined. This work will allow an intercomparison of RBR and SBE CTDs on the deep Argo extension.

Tests of the OPUS nitrate sensor (TriOS) on a BGC float already equipped with a SUNA nitrate sensor (Sea-Bird) were carried out in Villefranche by the LOV. The deployments of prototype were successful and data are processed for analysis.

COMMUNITY ENHANCEMENT

Mid-November, the 1st Moroccan float has been deployed, thanks to the collaboration between scientists from IEO and INRH (Moroccan Institut National de Recherche Halieutique).

PARTNERS



© Vasile-Sorin Balan/GeoEcoMar

2019-2022
Coordination by Euro-Argo ERIC

- **Funding:** 3.95M€, 536K€ for Euro-Argo
  European Union's Horizon 2020 research and innovation programme
- **Grant agreement ID:** 824131
- **Call for proposal:** H2020-INFRADEV-2018-1

WP5
Extension to high latitudes regions

WP6
Extension to Marginal Seas

WP7
Euro-Argo RISE visibility: communication and dissemination towards user's community

WP8
Integration of Euro-Argo activities in the general context of global ocean observations

Euro-Argo RISE activities were presented during various meetings:

- the 8th MonGOOS community during the meeting that took place early December in Trieste;
- the IX International Forum 'Arctic: Today and the Future' on 5th December in St. Petersburg;
- the Baltic Operational Oceanographic System (BOOS) Annual meeting mid-June in Rostock.

SERVICES TO USERS

The Marine Institute drafted a questionnaire on various aspects of services the Euro-Argo ERIC can provide to Argo users, with a focus on Argo data access. The final version was circulated mid-2020.

In addition, new tools are in development, such as a new Argo Data Selection Tool that should be available on the European GDAC in in autumn 2020, as well as the 3D data display tool, already available on JCOMMOPS website and presented during the 7th Euro-Argo Science Meeting.

Also part of the project, the 7th Euro-Argo Science Meeting was held in October and co-organised with HCMR. Participants welcomed warmly this 2019 edition, showing the need to regularly gather different types of users to better understand their requirements.

DATA MANAGEMENT

The Argo Data Management Team week had 3-in-one meetings on October 2019: the ADMT-20 annual meeting, a do-a-thon workshop focused on Argo visualization and the 8th BGC-Argo meeting. Expected results and some ongoing work within the project (DMQC cookbook, proposal on quality control software conversion, advancement of processing of BGC variables at the European level) were introduced to Argo international. The ADMT and BGC-Argo teams were keen to interact with Euro-Argo to progress on these activities.

CTS5 Argo float equipped with two nitrate sensors: OPUS (grey, at the front) and SUNA (black, on the side)

© Thomas Jessin/IMEV-LOV

MOCCA

MONITORING THE OCEANS AND CLIMATE CHANGE WITH ARGO

In 2015, the Executive Agency for Small and Medium-sized Enterprises (EASME) co-funded the Monitoring the Oceans and Climate Change with Argo (MOCCA) project for 5 years. With 5 M€, this project allowed Euro-Argo to procure and deploy 150 new floats measuring temperature and salinity. MOCCA made available more than 2000 quality-controlled data to the oceanographic and scientific communities.

▸ *https://www.euro-argo.eu/EU-Projects/MOCCA-2015-2020*

WORK PACKAGES

MOCCA project managed 150 floats, from procurement to science ready data. MOCCA project was organized alongside 4 work packages.

WP1
Coordination

WP2
Float procurement

MAIN ACHIEVEMENTS IN 2019

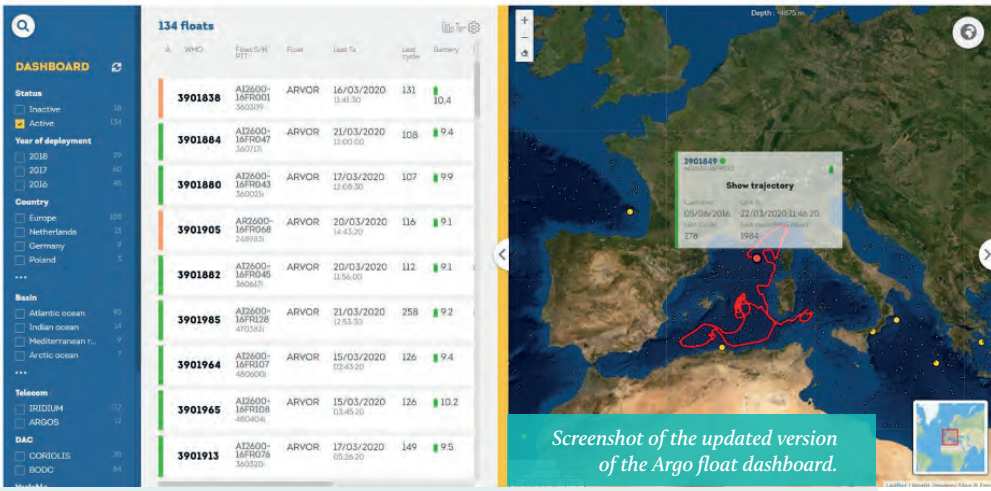
COORDINATION

In 2019, near the end of the project, Euro-Argo ERIC ensured all milestones are met and deliverables submitted.

MOCCA project activities widely communicated to the Argo community through different channels.

In September 2019, a Communication Officer has been hired to ensure the visibility of MOCCA and highlight the main results at the end of the project, thanks to a leaflet and a video. These dissemination contents would be available mid 2020.

MOCCA was also an active part of various conferences and workshops, such as the 7th Euro-Argo Science meeting, held on 22-23 October 2019 in Athens, Greece. This meeting allowed to bring together users of Argo data and to provide an opportunity for high-level science interactions in link with Argo. On this occasion, for instance, Tamaryn Morris (Marine Coordinator at South African Weather Service) had a talk about the six MOCCA floats deployed in the Agulhas Current to better understand the mixing and the fate of waters transported down the east coast of South Africa from the subtropics.



Screenshot of the updated version of the Argo float dashboard.

© Euro-Argo ERIC

FLOAT DATA PROCESSING

At-Sea monitoring

A new version of the Argo float dashboard has been updated and released in the framework of the MOCCA project. Click on the link below to select Argo floats and visualise their metadata, ocean measurements, trajectories and technical parameters:

▸ *https://fleetmonitoring.euro-argo.eu.*

This highly responsive and friendly website received great feedback at ADMT and is welcome by the whole community.

A successful recovery operation of the float 3901941 took place on Tuesday 10 September 2019 within an effective coordination between the crew of Research Vessel Oceania, Waldemar Walczowski from

PARTNERS

© Crédit Photo

2015-2020
Coordination by Euro-Argo ERIC

- **Funding:** 5M€, 3.14M€ for Euro-Argo
  Co-funded by
  The EMFF programme of the European Union
  Euro-Argo Members
- **Grant agreement ID:** SI2.709624
- **Call for proposal:** EASME/EMFF/2015/1.2.1.1

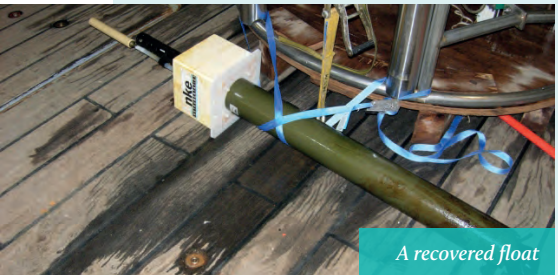
WP3
Float deployment

WP4
Float data processing
Focus on data quality

IOPAN Argo Poland team, Romain Cancouët from Euro-Argo Office and Coriolis data centre. In total, four floats were recovered during the whole project. It represents many benefits, such as the possibility to study the sensor post calibration, the reduction of environmental impact, in addition to the obvious reduction of material costs.

In addition, the MOCCA project allowed thematic studies on specific technical or scientific topics to be launched:

- study of impact of waves on GPS/Iridium performances, performed by Andrea García Juan (Euro-Argo ERIC);
- analyses of floats that went under ice, checking technical and improving ice-sensing algorithm in certain regions, performed by Ingrid Angel Benavides (BSH) that presented her results on "Argo floats in the European Artic Ocean and Nordic Seas: avoiding sea ice and detecting climate change", performed in the frame of the MOCCA project.



A recovered float

© Thomas Soltwedel/AWI

Focus on data quality

During the plenary of the 20th ADMT session, hosted in by Laboratoire d'Océanographie de Villefranche-sur-mer (LOV), France, on the week 13-18 October 2019, several results from studies performed in the framework of MOCCA were presented:

- early drift detection thanks to comparison of data with a min/max climatology;
- improvement of the spike test;
- improvement of the reference database for DMQC in the Mediterranean Sea;
- characterization of Argo float profiles associated with Antarctic Circumpolar Current fronts and zones.

MOCCA float deployed during the sailing expedition of Oyster 72 Katharsis II in Antarctica, below 62°S.

© Hanna Leniec-Koper & Piotr Kuklinski

ENVRIplus

ENVIRONMENTAL RESEARCH INFRASTRUCTURES

The ENVRIplus H2020 project aimed at bringing together Environmental and Earth System Research Infrastructures, projects and networks together with technical specialist partners to create a more coherent, interdisciplinary and interoperable cluster of Environmental Research Infrastructures across Europe.

2015-2019

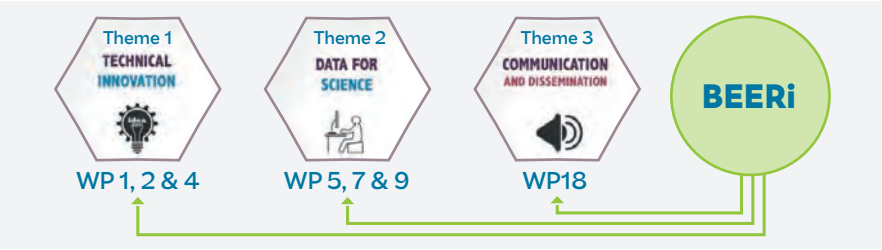
End of the project: 31st July 2019

Coordination by ICOS ERIC

- **Funding:** 15M€, 206K€ for Euro-Argo
- **Grant agreement ID:** 654182
- **Call for proposal:** H2020-INFRADEV-1-2014-1

EURO-ARGO CONTRIBUTION

The Euro-Argo ERIC, in partnership with Euro-Argo members, is involved in ENVRIplus themes and in the Board of European Environmental Research Infrastructures (BEERi).



2019 EURO-ARGO MAIN ACHIEVEMENTS

TECHNOLOGICAL INNOVATION

The Euro-Argo ERIC has monitored the completion of a development task concerning the implementation of a pCO_2 sensor on an Argo profiling float, within the work package 1.3. All developments have been carried out in collaboration with Ifremer RDT team, the float has been tested in the Ifremer tank, and then deployed in the Mediterranean Sea for a validation campaign in collaboration with the Laboratoire d'Océanographie de Villefranche-sur-mer (LOV) in 2018.

First results showed that the float was operating accordingly to the expectations, and the prototype demonstrated the ability to perform pCO_2 measurements with profiling floats at the descending phase with a pseudo-stabilized attitude, at least at depth.

The details of this work are presented in two deliverables finalized by Euro-Argo in July 2019.

▸ *https://www.euro-argo.eu/EU-Projects/Completed-projects/ENVRIplus-2015-2019/Deliverables*

COMMUNICATION AND DISSEMINATION

Euro-Argo has pursued its outreach activities in collaboration with the ENVRI community, and participated in a common booth at EGU 2019 where Birgit Klein (BSH) made a talk on recent development regarding Argo measurements in seasonal ice-covered regions.

DATA FOR SCIENCE

Euro-Argo developed the Cloud data subscription service for RIs:

- RIs products such as Argo dataset are registered in ENVRIPLUS catalogue;
- In the catalogue, an inter-thematic data subscription service from RIs data is proposed;
- The data subscription use case is implemented under the guidance of the ENVRI Reference Model (data curation, data citation scheme, accounting of data distribution).

BEERi

The Euro-Argo ERIC was also represented during the ENVRI Final week organized in March 2019 in Helsinki, and participated to activities of the BEERi:

- Contribution to the ENVRI sustainability plan (D17.5);
- Contribution to the "European ENVRI landscape and its further integration" White paper (D17.6);
- Contribution to the preparation of the ENVRI final event in Brussels in June 2019.

PARTNERS

For a list of all partners see:

▸ *https://www.envriplus.eu/partners*

ENVRI-FAIR

FINDABLE, **A**CCESSIBLE, **I**NTEROPE-RABLE AND **R**EUSABLE SERVICES

ENVRI-FAIR aims at enhancing the connection of the Cluster of ENVRI to the European Open Science Cloud (EOSC). It supports 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.

2019-2022

Coordination by FZJ

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

EURO-ARGO CONTRIBUTION

Built on ENVRIplus achievements, ENVRI-FAIR will enhance access to environmental research infrastructure data and products. It will be first driven by individual RI user needs, then by Marine domain user needs for integrated services, services that will be in the future available through the European Open Science Cloud (EOSC). These two themes allow the project to progress along the Euro-Argo 5-Year plan objective n°3 (see p. 18). Euro-Argo and EMSO Research Infrastructures coordinate the WP9 about the improvement of the FAIRness of the Marine Research Infrastructures.

2019 EURO-ARGO MAIN ACHIEVEMENTS

In 2019, an assessment of the FAIRness strengths and weaknesses of the data services has been performed for each Marine RI. For all RIs the F(indability) and A(cessibility) are pretty good but progress needs to be done on I(nteroperability) and R(eusability).

End of November 2019, a Marine Domain FAIRness Roadmap (D9.1) and its implementation plan → Figure 13 has been issued. It allowed to highlight some specific needs to integrate data:

- focus the developments on some key Essential Ocean Variables (EOVs) required by VIP users CMEMS and EMODnet;
- develop some cross-cutting requirements such as the enhancement of metadata through common vocabularies, agreement on mandatory information that will facilitate traceability of the data and the enhancement of machine-to-machine services.

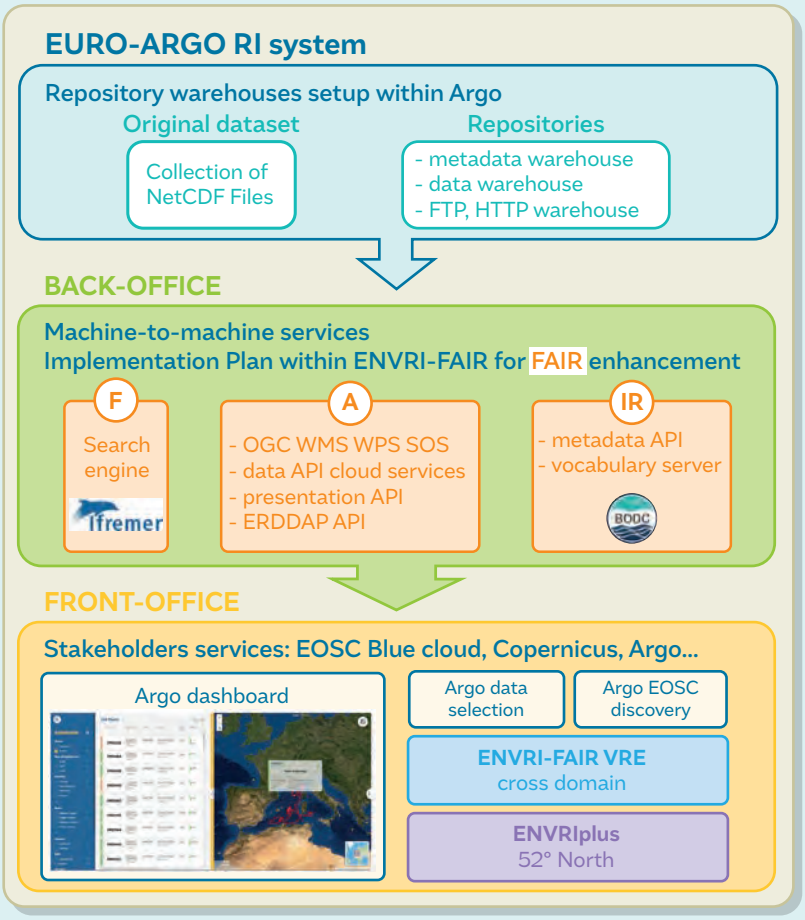


Figure 13: Euro-Argo RI Implementation plan for a FAIR data management system.

PARTNERS

Ifremer BODC

AtlantOS

ALL-ATLANTIC OCEAN OBSERVING SYSTEM

AtlantOS aimed at achieving a transition from a loosely-coordinated set of existing ocean observing activities producing fragmented, often monodisciplinary data, to a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System (IAOOS).

2015-2019

End of the project: September 2019

Coordination by GEOMAR

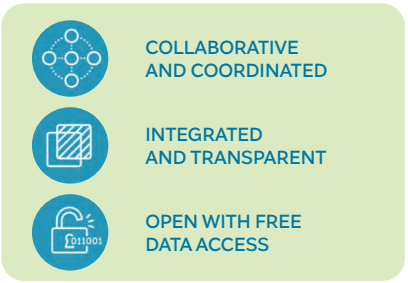
- **Funding:** 20.65M€, 588K€ for Euro-Argo
- **Grant agreement ID:** 633211
- **Call for proposal:** H2020-BG-2014-2

EURO-ARGO CONTRIBUTION

The Euro-Argo ERIC was leading the task related to Argo evolution (task 3.1) in WP3: "Enhancement of autonomous observing networks", and contributed to the following objectives:

- Enhance the readiness of autonomous platform observing networks so they become sufficiently mature for long-term sustainability;
- Support Atlantic observing communities within existing networks observing EOVs including international expertise in the design and development, operation and maintenance of IAOOS networks, and disseminate best practices, harmonizing data processing and quality control procedures.

This WP3 relies on 3 of the 6 guiding principles of the project:



2019 EURO-ARGO MAIN ACHIEVEMENTS

The 1st International AtlantOS Symposium "An All-Atlantic Ocean Observing System Ambitions and Opportunities feeding into the United Nations Decade of Ocean Science for Sustainable Development (2021-2030)" held in Paris on March 25-28th 2019 marked the end of the EU-H2020 AtlantOS project.

As a contribution to the development of the existing Argo observing system toward deeper depths (Deep-Argo) that complement and fill gaps between repeated hydrographic sections, 7 Deep Argo floats were purchased and deployed by the Euro-Argo ERIC. 6 BGC (biogeochemical) Argo floats measuring O2, nitrate concentration, Chlorophyll concentration, backscattering coefficient (optical proxy of Particulate Organic Carbon) and irradiance were also purchased and deployed in the Atlantic Ocean as a prefiguration of a sustained BGC-Argo network, especially in the South Atlantic, a biogeochemical hotspot where the target of 25% of the Argo fleet being of BGC-Argo type should be reached in the coming decade.

Three reports have been delivered by the Euro-Argo ERIC early 2019. Euro-Argo's contribution to the AtlantOS project participated in the enhancement of the Integrated Atlantic Observing System, while enabling to move one step forward in the implementation of the strategy for the evolution of Argo in Europe for the next decade.

The AtlantOS EU-H2020 project – that has now ended – laid the foundations for a basin-scale contribution to the Global Ocean Observing System: the AtlantOS program. The vision for this All-Atlantic Ocean Observing System in 2030 has been published in 2019 by DeYoung et al. in Frontiers for Marine Sciences and presented at the OceanObs19 conference.

As a conclusion to the AtlantOS project, success stories on the form of videos were published, one showing Argo as a successful example for moving towards an Integrated All-Atlantic Ocean Observing System in 2030, with the enhancement of deep and biogeochemical measurements in the Atlantic.

PARTNERS

EuroSea

EUROPEAN OCEAN OBSERVING AND FORECASTING SYSTEMS

In the continuation of the AtlantOS project achievements, the EuroSea international consortium aims 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

Beginning of the project: November 2019

Coordination by GEOMAR

- **Funding:** 12.642M€, 796K€ for Euro-Argo
- **Grant agreement ID:** 862626
- **Call for proposal:** H2020-BG-2019-1

EURO-ARGO CONTRIBUTION

The Euro-Argo ERIC is involved in two work packages: WP3 "Network Integration and Improvements" and WP7 "Ocean Climate Indicators Demonstrator", with the following objectives:

- WP3: will improve and strengthen ocean observing networks, foster networks innovations and oversee key aspects of technological integration towards higher Technology Readiness Levels and efficient data delivery to ensure that EuroSea datasets are ingested in the Copernicus Marine Service and EMODnet portfolios and to implement a set of standard operating procedures for long-term observation aligned to the GOOS Essential Ocean Variables;
- WP7: to assess the ocean role in climate through new ocean climate indicators with decreased uncertainty and to evaluate the economic value of the ocean carbon sink by developing information products linking ocean colour data with *in situ* data from autonomous platforms, such as BGC-Argo, moored instrumentation and long-range autonomous surface vehicles (ASVs) deployed in EuroSea.

Euro-Argo will focus on the joint use of Deep and BGC-Argo with the other networks making deep (GOSHIP, Fixed platforms) and BGC (fixed platforms, research vessels and ferryboxes, gliders, saildrones) measurements to move towards a better integrated observing system of systems and though demonstration use cases.

Euro-Argo will purchase 5 Deep and 5 BGC floats that will be used in two of the three demonstrations:

- Deep floats will be used jointly with other observing systems to study carbon fluxes and uptake in the Northwest Atlantic (Labrador and Irminger Seas) and the Western Mediterranean, two important areas for carbon uptake;
- BGC floats will be deployed side to moored platforms and autonomous surface vehicles to better monitor tropical carbon fluxes through network optimization of the Tropical Atlantic Observing System.

2019 EURO-ARGO MAIN ACHIEVEMENTS

Kicking off the project, 80 researchers and guests from politics and industry met at the opening conference at the Royal Belgium Institute for Natural Science (RBINS) in Brussels, on November 27-29th. Euro-Argo participated to the WP3 and WP7 meetings that clarified the WP objectives and plans, to the breakout sessions with the demonstration leaders to clarify user needs.

Participants to the EuroSea Kick-Off meeting, in Brussels, November 2019.

© EuroSea

PARTNERS

ERIC-Forum

EUROPEAN RESEARCH INFRASTRUCTURES CONSORTIUM

The European Commission had initiated a networking event, twice a year, where Managers of existing ERICs and scientists of future RIs who wanted to use the ERIC instrument could discuss shared experiences, highlight challenges and meet national policy makers establishing a platform for exchange of best practices.

2019-2022

Coordination : BBMRI ERIC

- **Funding:** 1.5M€
  44K€, 3.5 MM for Euro-Argo
- **Grant agreement ID:** 823798
- **Call for proposal:**
  H2020-INFRASUPP-2018-1

PROJECTS OBJECTIVES AND EURO-ARGO CONTRIBUTION

The project supports the organization of specific meetings, targeted thematic workshops focusing on shared challenges such as harmonized reporting and development of KPIs, ERIC evaluation process, VAT exemption practice, development of internal procurement rules, insurances and pensions policies, training of governance bodies representatives, etc. It also aims at supporting ERICs in preparation through the production of best practices documentation, as well as common communication and outreach activities in order to strengthen external representation of ERICs'.

Within the project, Euro-Argo is responsible for the task on VAT exemptions and associated deliverable in 2019, allowing the project to progress along Euro-Argo 5-Year plan objective n°5 (see p. 38).

2019 EURO-ARGO MAIN ACHIEVEMENTS

The project kicked-off in January 2019. In May 2019, Euro-Argo reported its preliminary results on VAT exemption during the 4th ERIC Forum meeting hold in Oslo, Norway. The work has started with the example of France, where several ERICs are hosted.

As part of its ERIC-Forum activities, Euro-Argo also participated in a workshop dedicated to common communication issues faced by ERICs, organized in Paris, in October 2019, in the framework of the RI-VIS H2020 project. The Euro-Argo ERIC also contributed to the ERIC Forum's response to the ERAC working group on ERA priorities and goals and to the ERIC Forum Position Paper on the Development of KPIs for Research Infrastructures.

Euro-Argo also contributed to the design of common rules for the new governance model of the ERIC that was discussed in October 2019 in Amsterdam. The governance was endorsed by the ERIC-Forum members early February 2020 with the set-up of the ERIC-Forum Executive Board.

ERIC-Forum community representatives.

PARTNER

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4 FIVE-YEAR INTERNAL EVALUATION

The Euro-Argo ERIC, created in 2014, celebrated its 5th anniversary in 2019. According to its status (Article 26) the ERIC has thus undergone an internal scientific evaluation. The evaluation was conducted by Euro-Argo Scientific and Technical Advisory Group (STAG), who reported to Euro-Argo Council.

© Francine Loubrieu/Euro-Argo ERIC

Romain Cancouët, Operational Engineer at Euro-Argo and Office member.

SUMMARY OF THE 5-YEAR INTERNAL EVALUATION

As part of the evaluation process, Euro-Argo Management Board and office prepared a 5-year report of the Euro-Argo ERIC past activities and a strategy plan for the 5 years to come. The documents were sent for review to the STAG at the end of the spring, and a series of meetings were held in Brest on 4 days in June 2019, gathering all the governance bodies of Euro-Argo as well as the Programme Manager and its team (ERIC office). The first 2 days were dedicated to the presentation and discussions of the 5-year achievements and 5-year plan for the future with the STAG, chaired by Glenn Nolan (EuroGOOS). The STAG then reported to Euro-Argo Council, chaired by Jean-Marie Flaud (French Ministry of Research and Innovation). Based on STAG advices, recommendations were finally made by the Council both to improve the reports and to clarify Euro-Argo plans for the future, which lead to a final 5-year Activity Report and a Five-Year plan for the future of Euro-Argo.

© Francine Loubrieu/Euro-Argo ERIC

The Council, the Management Board and some Members of the Scientific and Technical Advisory Group (STAG), gathered in June 2019, in Brest, France, for the Euro-Argo ERIC evaluation.

5-YEAR INTERNAL EVALUATION PUBLICATIONS

After the positive evaluation of Euro-Argo ERIC by its STAG, in June 2019, a report, a brochure and a new Five-Year plan were published in December 2019.

"Five-Year Plan 2019-2023"

It presents Euro-Argo future challenges and the five new objectives for the next phase.

▸ https://doi.org/10.13155/71936

"Achievements and future challenges 2014-2023" brochure

It summarizes the last five years main achievements and tells the story of the ERIC first steps, from its set-up in 2014 to its positive evaluation in June 2019.

▸ https://doi.org/10.13155/71339

"Activity Report 2014-2018"

It summarizes both report and plan.

▸ https://doi.org/10.13155/71937

If you wish a printed copy of one of these publications, don't hesitate to contact us:
contact@euro-argo.eu

5 SCIENTIFIC HIGHLIGHTS

"ISOW Spreading and Mixing as Revealed by Deep-Argo Floats Launched in the Charlie-Gibbs Fracture Zone"

Authors: Virginie Racapé, Virginie Thierry, Herlé Mercier, Cécile Cabanes.

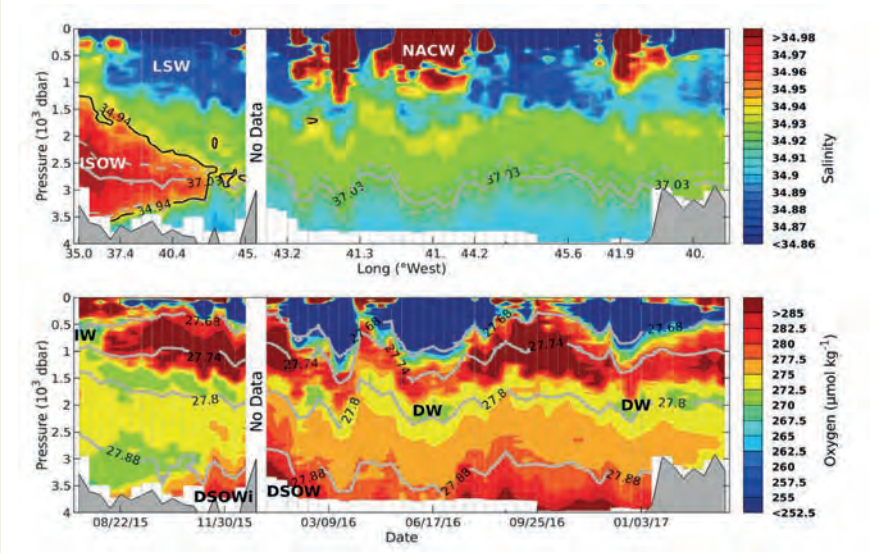
First published: 02 September 2019 ▸ https://doi.org/10.1029/2019JC015040

Abstract

To improve our understanding of deep circulation, we deployed five Deep-Argo floats (0–4,000 m) in the Charlie-Gibbs Fracture Zone (CGFZ), which channels the flow of Iceland-Scotland Overflow Water (ISOW), a dense water mass of the North Atlantic Ocean. The floats were programed to drift at 2,750 dbar in the ISOW layer. The floats mainly moved westward in the CGFZ, although some of them followed different routes for few cycles. One float revealed a direct route for ISOW from CGFZ to the Deep Western Boundary Current at Flemish Cap. In the CGFZ, oxygen data acquired by the floats revealed that the ISOW layer, was mainly composed of the highly oxygenated ISOW and the less oxygenated North East Atlantic Deep Water (NEADW). In the ISOW layer, the relative contribution of ISOW was generally larger in the northern valley than in the southern valley of CGFZ. Northward intrusions of the North Atlantic Current above the CGFZ increased the relative contribution of NEADW in the northern valley and favors mixing between ISOW and NEADW. The ISOW-NEADW signal flowing westward from the CGFZ toward the Deep Western Boundary Current was progressively diluted by Labrador Sea Water and Denmark Strait Overflow Water.

Plain Language Summary

The North Atlantic Ocean contributes to the uptake in the deep ocean of the excess of heat received by Earth due to human activities. The heat redistribution toward the rest of the ocean depends on the deep circulation, which is still largely unknown. To improve our understanding of this deep circulation, we deployed in 2015 and 2017 five Deep-Argo floats in the Charlie-Gibbs Fracture Zone (CGFZ), a gap in the Mid-Atlantic Ridge that constraints the pathway of deep-water masses. Those autonomous platforms freely drifted at 2,750 dbar in the core of the Iceland-Scotland Overflow Water (ISOW), a young water mass, rich in O2, originating from the Nordic Seas. One float revealed a new direct route of ISOW toward the subtropical gyre. The pathway followed by the floats west of the CGFZ depended on northward intrusions of the North Atlantic Current over the CGFZ. This interaction between the North Atlantic Current and the deep flow in the CGFZ favors the mixing of ISOW with the North East Atlantic Deep Water, an old water mass characterized by low O2. These results advocate for equipping Deep-Argo floats with oxygen sensors to improve understanding of deep circulation and water mass mixing.



Section of potential salinity and dissolved oxygen concentration measured in the CGFZ by DP15-3 float.

**ISOW: Iceland-Scotland Overflow Water; IW: Intermediate Water; LSW: Labrador Sea Water; DW: Deep Water; DSOW: Denmark Strait Overflow Water, DSOWi: interior DSOW and NACW: North Atlantic Central Water. Gray dashed lines on the salinity section represent the 37.01σ2 and 37.05 σ2 isopycnals.*

"*Towards the integration of animal-borne instruments into global ocean observing systems*"

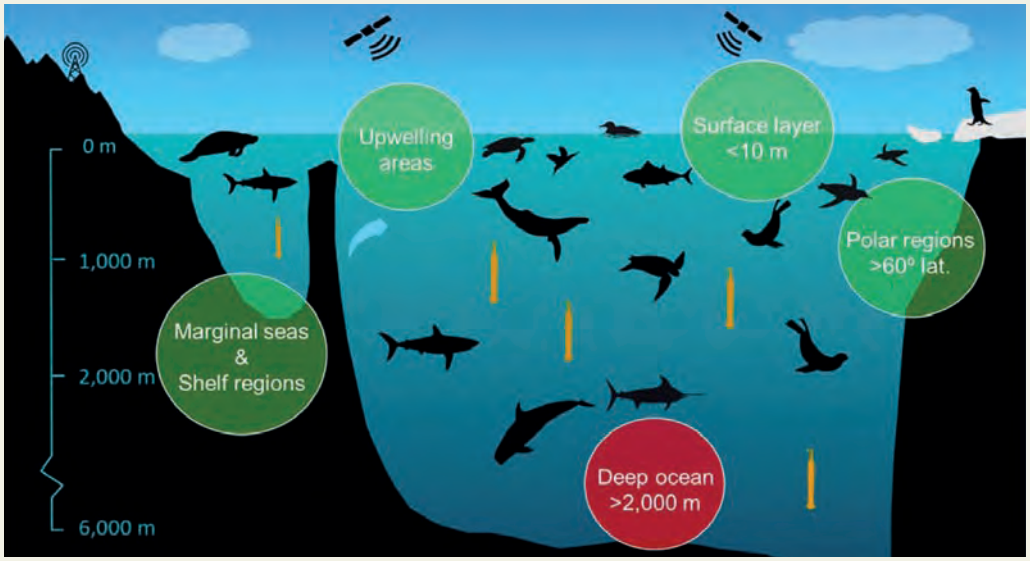
Authors: David March, Lars Boehme, Joaquín Tintoré, Pedro Joaquín Vélez-Belchi, Brendan J. Godley.
First published: 01 November 2019 ▸ *https://doi.org/10.1111/gcb.14902*

Abstract

Marine animals are increasingly instrumented with environmental sensors that provide large volumes of oceanographic data. Here, we conduct an innovative and comprehensive global analysis to determine the potential contribution of animal-borne instruments (ABI) into ocean observing systems (OOSs) and provide a foundation to establish future integrated ocean monitoring programmes. We analyse the current gaps of the long-term Argo observing system (>1.5 million profiles) and assess its spatial overlap with the distribution of marine animals across eight major species groups (tuna and billfishes, sharks and rays, marine turtles, pinnipeds, cetaceans, sirenians, flying seabirds and penguins). We combine distribution ranges of 183 species and satellite tracking observations from >3,000 animals. Our analyses identify potential areas where ABI could complement OOS. Specifically, ABI have the potential to fill gaps in marginal seas, upwelling areas, the upper 10 m of the water column, shelf regions and polewards of 60° latitude. Our approach provides the global baseline required to plan the integration of ABI into global and regional OOS while integrating conservation and ocean monitoring priorities.

Plain Language Summary

How to fill some of the gaps of the current ocean observing system? Thanks to the contribution of Animal-Borne Instruments (ABI), scientists answer. Thus, marine animals have been more and more instrumented to measure ocean temperature and salinity in recent years. They have the potential to complement the current network of about 4000 Argo floats. By comparing the areas covered by Argo floats and those covered by ABIs, the researchers concluded that ABIs are able to provide a significant added-value: they can swim in specific regions of the global ocean that are sometimes tricky for the floats to reach. In particular, they are able to access Marginal Seas, upwelling areas, the upper 10 m of the water column, shelf regions and polewards of 60° latitude. Measurements in these regions are crucial to understand how the ocean is changing both naturally and as a result of human activities. Despite some species can dive as much as 2,000 m depth, ABIs have limited potential to monitor the deep ocean, which is currently supported by the Deep Argo programme. Argo floats should work hand in hand with marine animals for a better coverage of ocean observations, while improving our understanding of marine animal behaviors.



Schematic representation of the gaps of the Argo observing system and potential contribution of Animal-Borne Instruments. Vertical distribution of taxonomic groups reflects the median and maximum dive depths.

6 FINANCIAL STATUS

There is a positive balance of about 69K€ in Euro-Argo ERIC 2019 budget execution. This is mainly due to the contribution of about 282K€ that the ERIC received in 2019 for staff funding from the EU projects. The central ERIC income in 2019 stayed at 340K€ with 11 Member countries and 1 Observer.

Salary expenses is around 361K€ (79K€ on ERIC and about 282K€ on projects). Other expenses increased by 250K€ compared to 2018 in link with communication and outreach expenditure due to the 5-year evaluation. 100K€ were also dedicated in the ERIC budget to buy 5 floats as a contribution to the global array. A positive balance of 69K€ (116K€ on the ERIC, deficit of 47K€ on projects) is reached at the end of the year 2019.

As far as projects are concerned, the budget execution is as planned for MOCCA, AtlantOS and ENVRIplus, and incomes following the project reporting period justification are expected second half of 2020 as both AtlantOS and ENVRIplus have been extended until respectively September 2019 and July 2019. The deficit on project is due to the fact the ERIC is waiting for the final payment of the projects that ended in 2019.

EURO-ARGO 2019 FINANCIAL STATUS

TYPE	DEBIT	CREDIT	TOTAL
Initial balance			711 677
SG: Sales of goods		565 460	565 460
GC: Grants & Contracts		760 036	760 036
MF: Membership fees		340 000	340 000
II: Interest income		0	0
PG: Purchases of Goods	558 953		- 558 953
PE: Personnel costs	361 342		- 361 342
TV: Travel costs	60 917		- 60 917
MA: Material costs	2 413		- 2 413
AC: Accounting fees	8 446		- 8 446
BS: Bank services	325		- 325
SC: Other subcontracts	177 826		- 177 826
DP: Depreciation	425 927		- 425 927
Total flows	1 596 149	1 665 495	
End balance			781 023

Table 5: Financial status – Summary 2019 – Grand Total.

EVOLUTION OF THE BUDGETS

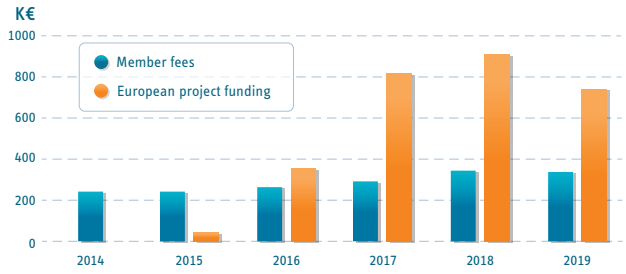


Figure 14: Evolution of the Euro-Argo ERIC budget.

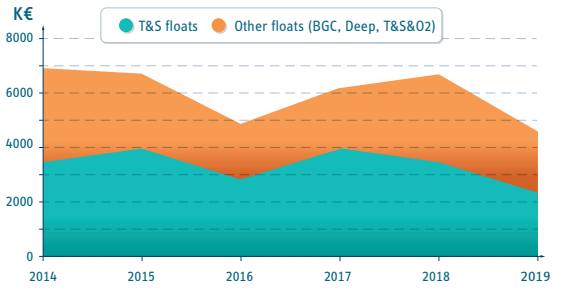


Figure 15: Euro-Argo ERIC float budget evolution.

© Alberto González Santana/IEO

ANALYSIS PER PROJECT

	ERIC	EA-RISE	MOCCA	ENVRIplus	ENRI-FAIR	AtlantOS	EuroSea	ERIC Forum	Jerico-next	Total
Purchases of Goods for resale	558 953									558 953
Other cost	11 184									11 184
Insurance			6060							6 060
Personnel costs	79 180	68 538	167 203.14	31 091.69	5 746	7 021.35	0	2 373	188.46	361 342
Business travel	19 864	12 742	9 268.84	7 279	3 476	3 563	1 057	3 666		60 917
Depreciation	10 731		380 618.63			34 577.52				425 927
Subcontract	108 774		55 698.64			7293.58				171 766
Subtotal	788 686	81 281	618 849	38 371	9 222	52 456	1 057	6 039	188	1 596 149

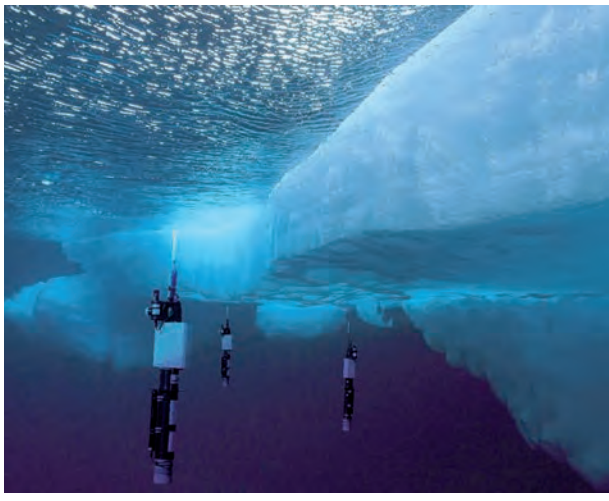
	ERIC	EA-RISE	MOCCA	ENVRIplus	ENRI-FAIR	AtlantOS	EuroSea	ERIC Forum	Jerico-next	Total
Sales of goods for resale	565 460									565 460
Operating grants		101 601	529 735	39 120	11 528	68 946	1 322	7 548	236	760 035
Subscritpion members and observers	340 000									340 000
Accounting result	116 774	20 320	- 89 114	750	2 306	16 490	264	1 510	47	69 346

Table 6: Financial analysis for each project Euro-Argo is involved in.

EURO-ARGO MEMBERS AND OBSERVER 2019 BUDGET

COUNTRY	FLOATS PURCHASED	FLOATS DEPLOYED FROM AIC	FULL TIME EMPLOYEE
Bulgaria	2	2	0.15
Finland	4	4	0.21
France	63	71	10.2
Germany	49	39	2.5
Greece	3	3	0.3
Ireland	3	3	0.1
Italy	21	23	1.5
Netherlands	2	2	0.08
Norway	15	14	1.2
Poland	3	2	0.75
Spain	8	8	0.35
UK	14	14	4.4
Total	187	189	20.72

Table 7: Euro-Argo Members and Observer 2019 budget.



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ANNEXES

ANNEX 1 - GLOSSARY

ADMT
Argo Data Management Team

AIC
Argo Information Centre

ARC
Argo Regional Centre

AST
Argo Steering Team

AtlantOS
All-Atlantic Ocean Observing System

BEERI
Board of European Environmental Research Infrastructure

BGC
Biogeochemical

BIO
Biogeochemical floats with only 1 to 5 variables

BOOS
Baltic Operational Oceanographic System

BSH
Bundesamt für Seeschifffahrt und Hydrographie

Chla
Chlorophyll a

CMEMS
Copernicus Marine Environment Monitoring System

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

CTD
Conductivity, Temperature, Depth

DAC / GDAC
Data Assembly Centre / Global Data Assembly Centre

DEEP
Argo floats diving to greater depths than 2000 meters

DO
Dissolved Oxygen

DMQC
Delayed Mode Quality Control

EASME / EMFF
Executive Agency for SMEs / European Maritime and Fisheries Fund

EGU
European Geophysical Union

EMBRC
European Marine Biological Resource Centre

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

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

FMI
Finnish Meteorological Institute

FZJ
Forschungszentrum Jülich

GDAC
Global Data Assembly Centre

GeoEcoMar
Institutul National de Cercetare-Dezvoltare pentru Geologie si Geoecologie Marina

GEOMAR
Helmholtz-Zentrum für Ozeanforschung Kiel

GOOS
Global Ocean Observing System

GSO
Group of Senior Officials

HCMR
Hellenic Centre for Marine Research

IAOOS
Ice - Atmosphere - Arctic Ocean Observing System

ICOS
Integrated Carbon Observation System

IEO
Instituto Español de Oceanografía

Ifremer
Institut Français de Recherche pour l'Exploitation de la Mer

IMR
Institute of Marine Research

INRH
Moroccan Institut National de Recherche Halieutique

IOPAN
Institute of Oceanology of the Polish Academy of Sciences

IO-BAS
Institute of Oceanology – Bulgarian Academy of Sciences

IOC
Intergovernmental Oceanographic Commission

ISA
Ice Sensing Algorithm

JCOMMOPS
Joint technical Commission for Oceanography and Marine Meteorology in situ Observations Programme Support Centre

KNMI
Koninklijk Nederlands Meteorologisch Instituut

LOV
Laboratoire d'Océanographie de Villefranche

MB
Management Board

MI
Marine Institute

MOCCA
Monitoring the Oceans and Climate Change with Argo

MoonGOOS
Mediterranean Operational Network for the Global Ocean Observing System

NERSC
Nansen Environmental and Remote Sensing Center

NOC
National Oceanography Centre

OGS
Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (National Institute of Oceanography and Applied Geophysics)

OWC
OWC method (Owens and Weng, 2009; Cabanes et al, 2016)

RBINS
Royal Belgium Institute for Natural Science

ROOS
Regional Ocean Observing System

RTQC
Real Time Quality Control

SOCIB
Sistema d'observació i predicció costaner de les Illes Balears (Balearic Islands Coastal Observing and Forecasting System)

SOOS
Southern Ocean Observing System

STAG
Scientific and Technical Advisory Group

SUST BLACK
Sustainable Development at the Black Sea

T/S
Temperature/Salinity

WMO
World Meteorological Organization

ANNEX 2 - PARTNERS OF EURO-ARGO ERIC

Country	Statute	Representing Organisation
Bulgaria	Member	IO-BAS
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
United Kingdom	Member	Met Office
Poland	Observer	IOPAN

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

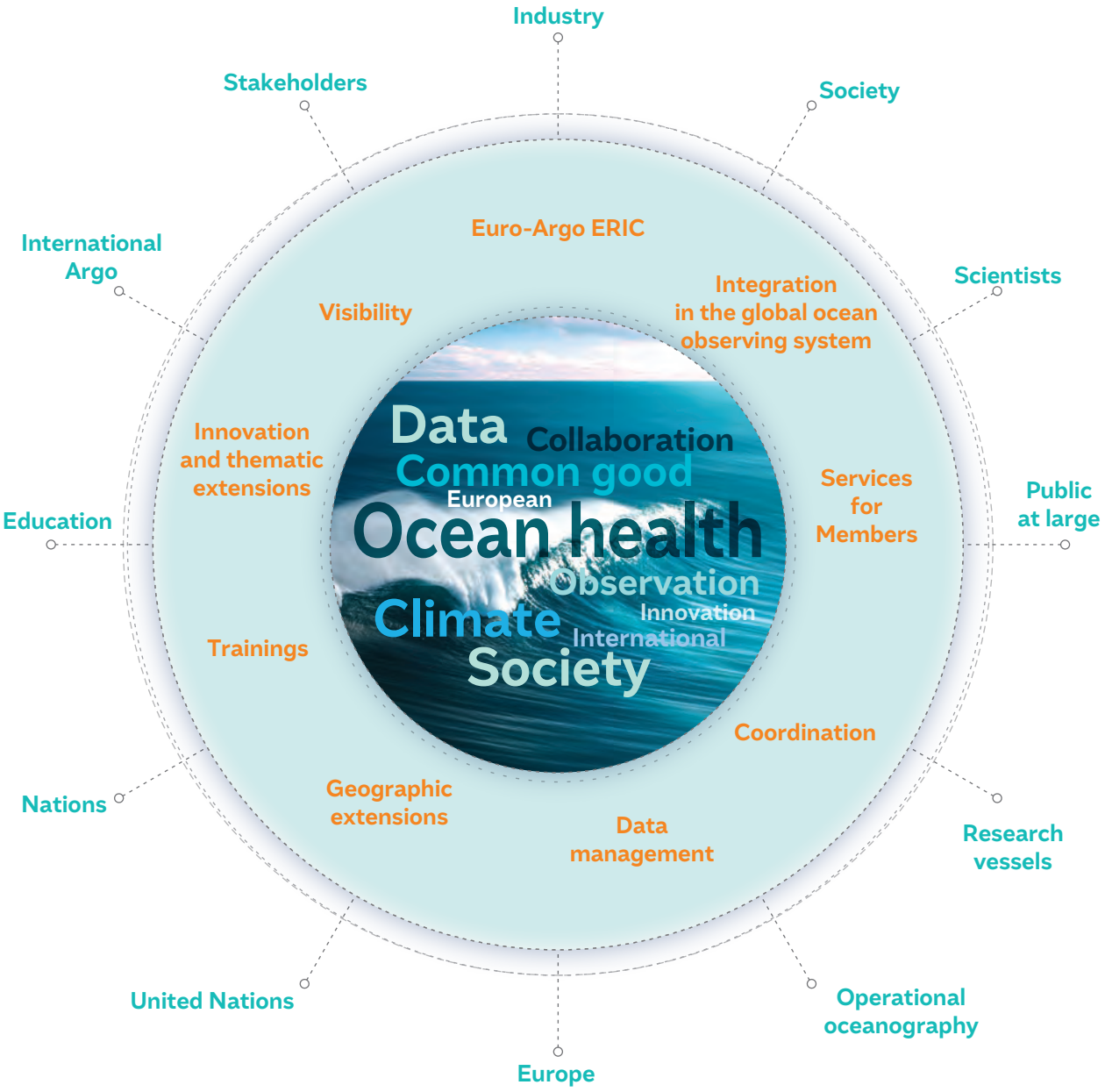
ANNEX 3 - EURO-ARGO ERIC GOVERNANCE BODIES

	Profession / Position
Council Members	
Jean-Marie Flaud	*Chair* - MESR France
Pierre-Marie Poulain	OGS – Italy
Jon Turton	Met Office – UK
Aristomenis Karageorgis	HCMR – Greece
Sibren Drijfhout	KNMI – Netherlands
Mikko Strahlendorff	FMI – Finland
Kerstin Jochumsen	BSH – Germany
Marta Tarnogrodzka	Ministry of Science and Higher Education – Poland
Christine Daae Olseng	Research Council of Norway - Norway
Joaquin Tintoré	SOCIB – Spain
Michael Gillooly	Marine Institute - Ireland
Atanas Palazov	Institute of Oceanology - Bulgarian Academy of Sciences - Bulgaria
Pierre-Yves Le Traon	Special Advisor to the French representative - France
Management Board Members	
Birgit Klein	*Chair* – BSH – Germany
Laura Tuomi	*Vice-Chair* – FMI – Finland
Alan Berry	Marine Institute – Ireland
Gerasimos Korres	HCMR – Greece
Pedro Vélez-Belchi	IEO – Spain
Guillaume Maze	Ifremer – France
Kjell Arne Mork	IMR – Norway
Waldemar Walczowski	IOPAN – Poland
Andreas Sterl	KNMI – Netherlands
Matt Donnelly	NERC-BODC – United Kingdom
Giulio Notarstefano	OGS – Italy

	Profession / Position
Euro-Argo ERIC Central Research Infrastructure	
Sylvie Pouliquen	Programme Manager – Ifremer France
Francine Loubrieu	Administrative Assistant – Ifremer France
Grigor Obolensky	Programme Engineer – CNRS France
Romain Cancouët	Operational Engineer – Euro-Argo ERIC
Claire Gourcuff	Science Officer – Euro-Argo ERIC
Estérine Evrard	Euro-Argo RISE Project Manager – Euro-Argo ERIC
Andrea García Juan	Research Engineer
Marine Bollard	Communication Officer
Scientific & Technological Advisory Group (STAG)	
Arne Körtzinger	*Chair* – GEOMAR 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

ANNEX 4 - LIST OF INSTITUTIONS

COUNTRY	PARTNERS	EURO-ARGO COUNCIL	CONTRIBUTION FROM
Bulgaria	Ministry of Education and Science	IO-BAS	University of Sofia National Institute of Meteorology & Hydrology
Finland	Ministry of Transport and Communication	FMI	
France	Ministry of Research	Ifremer	SHOM INSU-CNRS-SU / LOV
Germany	Federal Ministry of Transport and Digital Infrastructure	BSH	Geomar University of Hamburg ICBM/ University of Oldenburg AWI IOW
Greece	Ministry of Education	HCMR	
Ireland	Department of Agriculture, Food and the Marine (DAFM)	Marine Institute	
Italy	Ministry for Education	OGS	
Netherlands	Royal Netherlands Meteorological Institute	KNMI	
Norway	Ministry of Trade, Industry and Fisheries	IMR	
UK	Department for Business, Energy & Industrial Strategy (BEIS)	Met Office NERC-BODC	NERC-NOC PML
Spain	Ministerio de Economía y Competitividad	IEO SOCIB	
OBSERVERS			
Poland	Ministerstwo Nauki i Szkolnictwa Wyższeg	IOPAN	
CANDIDATE MEMBERS			
Portugal		IH IPMA	


Industry
Stakeholders
Society
Euro-Argo ERIC
International Argo
Scientists
Integration in the global ocean observing system
Visibility
Innovation and thematic extensions
Data
Collaboration
Common good
European
Ocean health
Observation
Innovation
International
Climate
Society
Services for Members
Public at large
Education
Trainings
Coordination
Nations
Geographic extensions
Data management
Research vessels
United Nations
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Euro-Argo ERIC
Campus Ifremer
Technopôle Brest Iroise
1625 Route de Sainte-Anne
29280 Plouzané
France

Tel.: +33 (0)2 98 22 44 83 | www.euro-argo.eu | contact@euro-argo.eu | @EuroArgoERIC