Argo float deployment.

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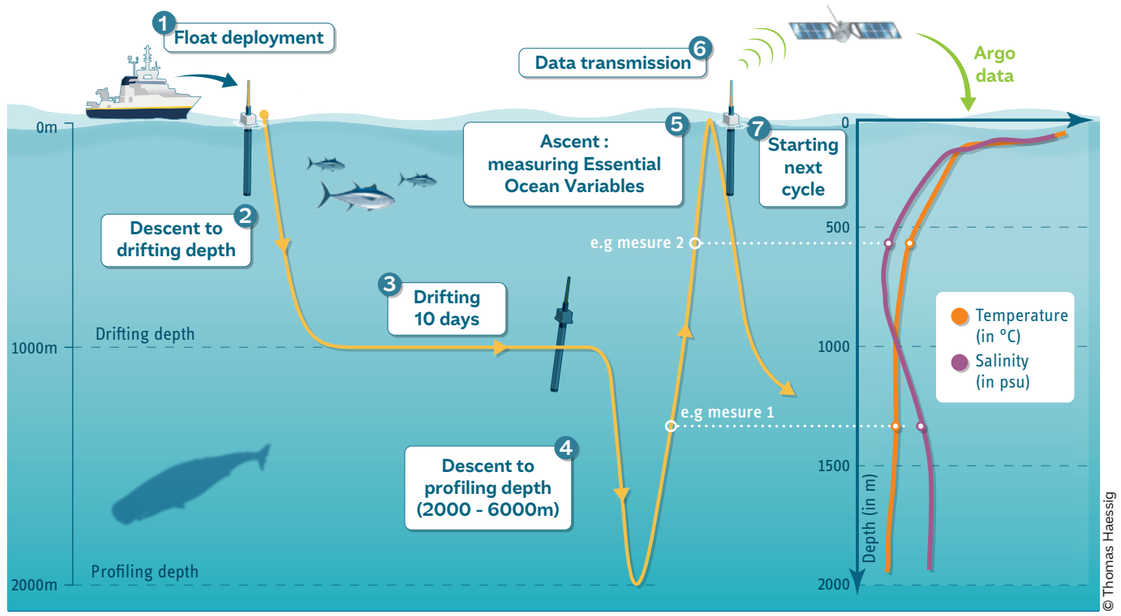
1 EURO-ARGO ERIC: A LEADER IN THE ARGO FLOATS REVOLUTION

Since 2014, the Euro-Argo European Research Infrastructure Consortium (ERIC) has been cultivating the power of dozens of science institutes across Europe to grow and upgrade the Argo floats array, a game-changing Ocean Observation programme, transforming ocean research.

When Birgit Klein deployed her first Argo float at sea 18 years ago, it was an intense experience. "You have something worth the price of a car in your hands and you toss it in the ocean!" remembers this oceanographer from the Federal and Maritime and Hydrographic Agency in Hamburg, Germany. At first glance, these 2-metre-long steel cylinders with an antenna on top don't seem like much. But looks can be deceiving. The Argo floats cost indeed between 20 000 and 150 000 euros each. And more importantly, they have revolutionised the way we monitor the global ocean.

The floats are equipped with sensors that measure ocean properties, like its temperature, or salinity. Once they are deployed, they sink and rise autonomously. Following a 10-day cycle, they descend down to 1 000 metres where they save energy and drift with



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A full 10-day cycle of an Argo float and the corresponding profile collected.

Euro-Argo float deployed thanks to an inflatable boat launched from a research vessel.

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4 000 Argo floats
are deployed around the world ocean with the contribution of
30 countries
representing strong global cooperation and commitment.

WHAT IS ARGO?

Argo is an international programme that collects information from inside the ocean using a fleet of robotic instruments that drift with the ocean currents and move up and down between the surface and down to 6 000 metres deep. Each instrument, called float, spends almost all its lifetime below the surface.

WHAT IS AN ERIC?

The European Research Infrastructure Consortium (ERIC) is a specific legal form that facilitates the establishment and operation, on a non-economic basis, of Research Infrastructures with European interest. The ERIC membership is made up, on a voluntary base, of EU Member States and associated countries. By 2022, 24 research infrastructures have been established as ERIC in fields as various as Energy, Environment, Health & Food, Physical Sciences & Engineering, and Social & Cultural Innovation. Euro-Argo ERIC was created in 2014 to coordinate and foster the collaboration between national Argo programmes.

THE POSITIVE IMPACTS OF ARGO FLOATS ON THE ENVIRONMENT AND SOCIETY

Argo floats produce free and open-sourced data in Near Real Time

For weather, climate and ocean prediction

The data are used by operational services:

Argo data improve the accuracy of the ocean forecasts and are critical for developing reliable seasonal to decadal climate predictions. Argo is a game changer in terms of Ocean Observations.

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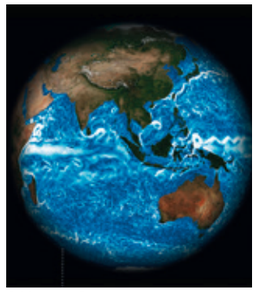

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For climate change mitigation

Scientists use these data for societal benefit:

One of Argo's most important scientific contribution is a huge improvement in the estimation of heat stored by the oceans – key for understanding global warming, rising sea levels and ocean health.

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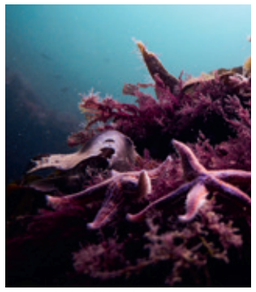

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Positive impacts on the environment and society
Contribution to 2 of the 17 Sustainable Development Goals (SDGs) adopted by all United Nations Member States in 2015.

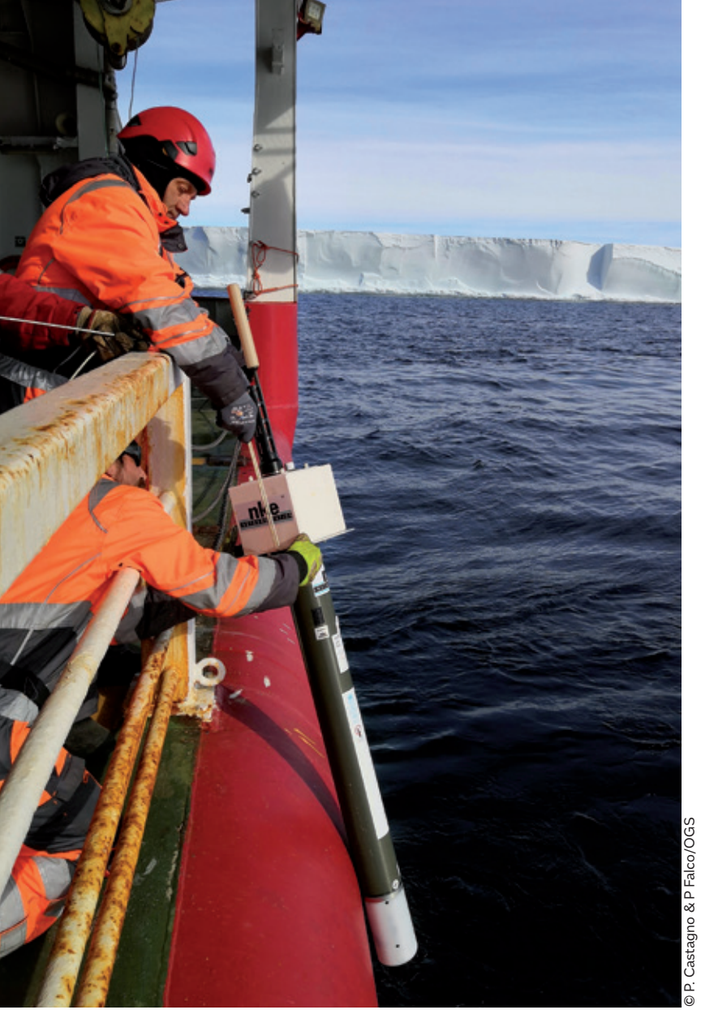
Argo data are used by a wide range of scientific and operational oceanography teams.

the currents, then in the final operational phase, they descend at the prescribed depth, set by the scientists who deployed them, before ascending.

Solely on their way up, their sensors analyse the temperature, the salinity, the oxygen content, the chlorophyl concentration and other environmental parameters of the sea water. They will measure what is called a profile, providing a set of data all along the water column. Once they reach the surface, the devices transmit their measurements via satellite. Argo floats also give precious information about deep ocean currents, deduced from two consecutive surfacings and crucial information for operational engineers who keep an eye on them, about their own functioning, such as the level of their battery.

The floats are deployed all over the planet in a global network of sentinels constantly surveying the global ocean. Their collected data are used for a plethora of applications, from predicting the weather and tracking currents to studying the role of the oceans in our changing climate.
The measurements collected become data that can be used by scientists and operational oceanography. Operational oceanography is like weather monitoring and forecasting for the ocean. It relies on powerful computers and numerical models that process *in situ* data, combined with satellite observations. The results of these models can be used, for example, to deduce warnings of coastal floods or ice and storm damage, optimum routes for ships, ocean currents, ocean climate variability, etc. And what has also made the Argo programme a game-changer since its inception in 1999 is that all the data gathered are free, open, quality-controlled and almost instantly available to everybody: scientists, businesses and private individuals alike. And with a tally of about 4 000 floats deployed all around the planet and made up of 30 different countries' contribution, the programme represents strong international scientific cooperation of unique scale, transcending borders but also generations.

One quarter of the Argo floats in the world is managed by the Euro-Argo European Research Infrastructure Consortium (ERIC). "To deploy and maintain the floats, we need continuous funding, that's why we came up with the idea of the ERIC in 2008," recalls Sylvie Pouliquen, co-founder and former Programme Manager of the Euro-Argo ERIC.



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Deployment in Antarctic waters.

Euro-Argo makes up 25% of the Argo international floats network

In 2014, the infrastructure was finalised and hosted in France, harnessing the political and financial commitment of nine countries. Today, the consortium is composed of 13 European countries and represents a joint effort of about 30 science institutes. “We are involved at all levels: floats purchase and deployment, new technology development, data management or research strategy,” says Sylvie Pouliquen. “With our partners, we define what this network of floats should be and how it should evolve, keeping in mind to target the new OneArgo global, full-depth and multidisciplinary design.” Proof that joining forces with the ERIC works: according to Sylvie Pouliquen, about one fourth of the Argo-related research papers recently produced in the world are authored by European teams. And this European contribution should be consolidated in the coming years, to face the new challenges related to the implementation of the ambitious OneArgo.

Besides strengthening the role of Europe within the international Argo programme, the Euro-Argo ERIC addresses European specific priorities. One component of the 2019-2022 EU-funded project called Euro-Argo-RISE* (Research Infrastructure Sustainability and Enhancement) was to develop techniques and technologies that will help improve the Argo coverage in regional seas where floats are scarce: shallower waters, marginal seas and icy areas such as the European polar seas. The latter is the field of expertise of Birgit Klein, whose agency is part of the Euro-Argo ERIC. “On the European side of the Arctic Ocean, we decided to monitor a large area that is seasonally ice-free,” explains the German researcher. “But you really don’t want the floats to hit some ice at the surface or they could be damaged”. With her colleagues, she’s now studying techniques and tools that could protect the floats against sea ice. Acquiring then much more measurements in the high latitudes is indeed a timely challenge with respect to global warming.

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WHAT IS ONEARGO?

OneArgo is the new “global, full-depth and multidisciplinary” Argo programme design, including the three missions: Core Argo (measuring temperature and salinity), BGC Argo (able to report up to six biogeochemical additional variables, such as pH and Deep Argo (able to dive till the abyss).
It revolutionises ability to observe and predict the impact of climate change on oceanic heat uptake, global water cycle and sea level rise, as well as ocean ecology, metabolism, carbon uptake, and marine resource modelling.
Most importantly, it increases end-user value and the benefits for society at large, for instance through more accurate climate projections enabling better societal adaptation.

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Deployment by the Greek member of Euro-Argo ERIC.

FIND OUT MORE

- Video “Euro-Argo: Transforming Global Ocean Observation”: https://youtu.be/im4HVIK4hVU
- International Argo Programme: argo.ucsd.edu
- Euro-Argo: www.euro-argo.eu
- OneArgo: Owens et al. (2022) “OneArgo: A New Paradigm for Observing the Global Ocean”, Marine Technology Society Journal, https://doi.org/10.4031/MTSJ.56.3.8, 2022

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https://www.eu4oceanobs.eu/oceanobserving-awareness/ocean-observing-awareness-euro-argo/

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