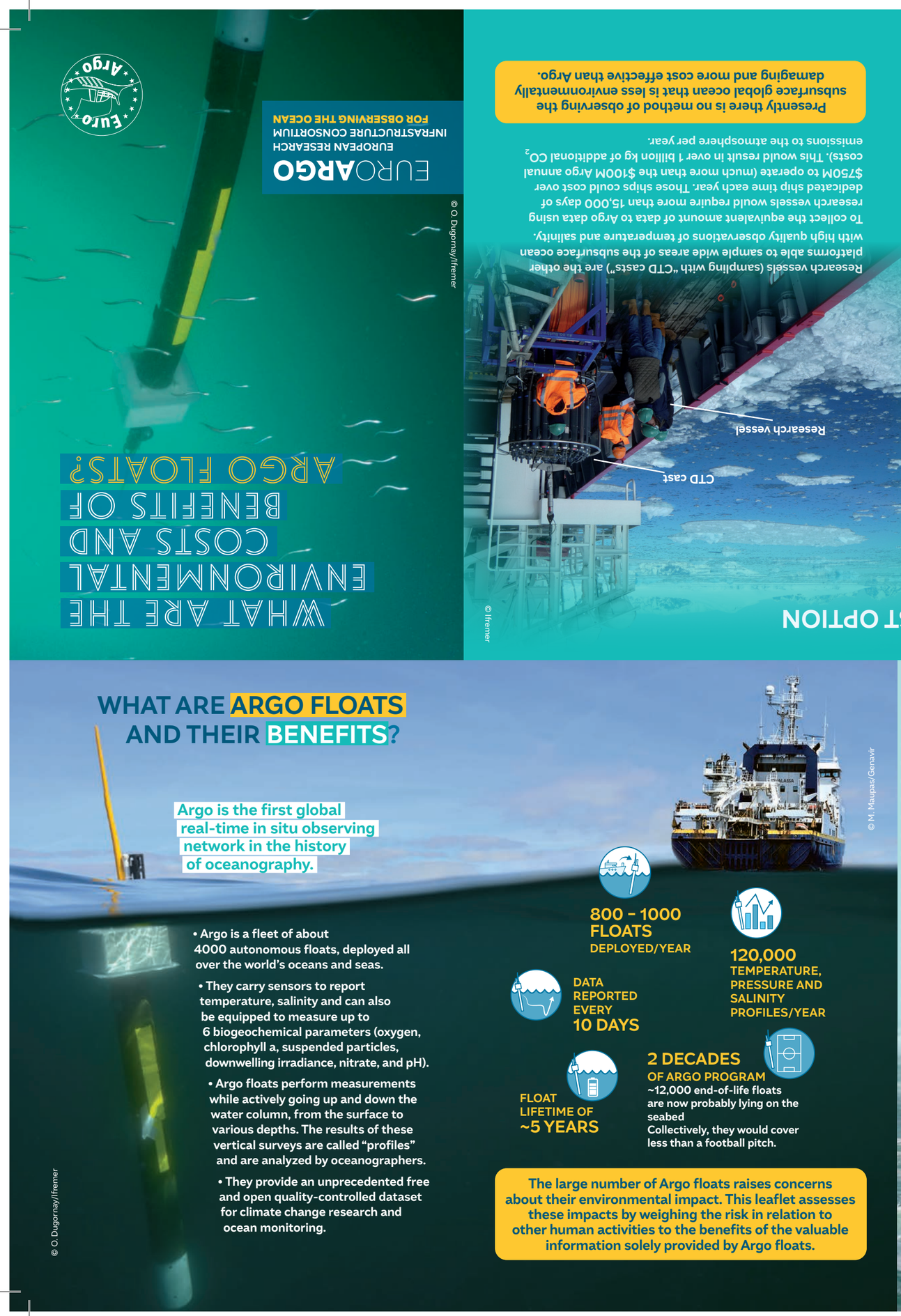
WHAT ARE ARGO FLOATS AND THEIR BENEFITS?

Argo is the first global real-time in situ observing network in the history of oceanography.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- Argo is a fleet of about 4000 autonomous floats, deployed all over the world's oceans and seas.
- They carry sensors to report temperature, salinity and can also be equipped to measure up to 6 biogeochemical parameters (oxygen, chlorophyll a, suspended particles, downwelling irradiance, nitrate, and pH).
- Argo floats perform measurements while actively going up and down the water column, from the surface to various depths. The results of these vertical surveys are called "profiles" and are analyzed by oceanographers.
- They provide an unprecedented free and open quality-controlled dataset for climate change research and ocean monitoring.

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800 – 1000 FLOATS DEPLOYED/YEAR

120,000 TEMPERATURE, PRESSURE AND SALINITY PROFILES/YEAR

DATA REPORTED EVERY **10 DAYS**

2 DECADES OF ARGO PROGRAM

~12,000 end-of-life floats are now probably lying on the seabed
Collectively, they would cover less than a football pitch.

FLOAT LIFETIME OF **~5 YEARS**

The large number of Argo floats raises concerns about their environmental impact. This leaflet assesses these impacts by weighing the risk in relation to other human activities to the benefits of the valuable information solely provided by Argo floats.

THE POSITIVE IMPACTS OF ARGO FLOATS ON THE ENVIRONMENT AND SOCIETY

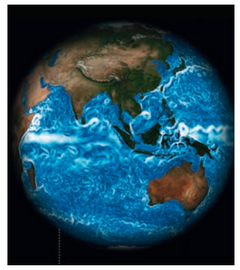
Argo floats produce free and open-sourced data

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.


© NASA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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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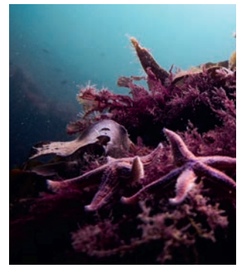
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Positive impacts on the environment and society

Contribution to 2 of the 17 Sustainable Development Goals (SDGs) adopted by all United Nations Member States in 2015.

13 CLIMATE ACTION

14 LIFE BELOW WATER

WHAT ARE THE ENVIRONMENTAL COSTS AND BENEFITS OF ARGO FLOATS?

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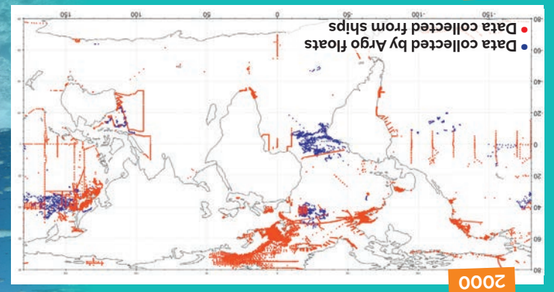
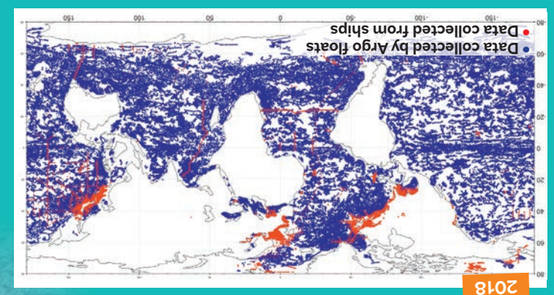
EUROARGO
EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM
FOR OBSERVING THE OCEAN

Argo

WHY ARGO FLOATS ARE THE BEST OPTION TO MONITOR THE OCEAN?

Prior to the advent of the Argo program the ocean was not adequately monitored.





Positions of measurement points (temperature, pressure and salinity profiles) collected with research vessels or Argo floats.

© Ifremer

Research vessels (sampling with "CTD casts") are the other platforms able to sample wide areas of the subsurface ocean with high quality observations of temperature and salinity.

To collect the equivalent amount of data to Argo data using research vessels would require more than 15,000 days of dedicated ship time each year. Those ships could cost over $750M to operate (much more than the $100M Argo annual costs). This would result in over 1 billion kg of additional CO_2 emissions to the atmosphere per year.

Presently there is no method of observing the subsurface global ocean that is less environmentally damaging and more cost effective than Argo.

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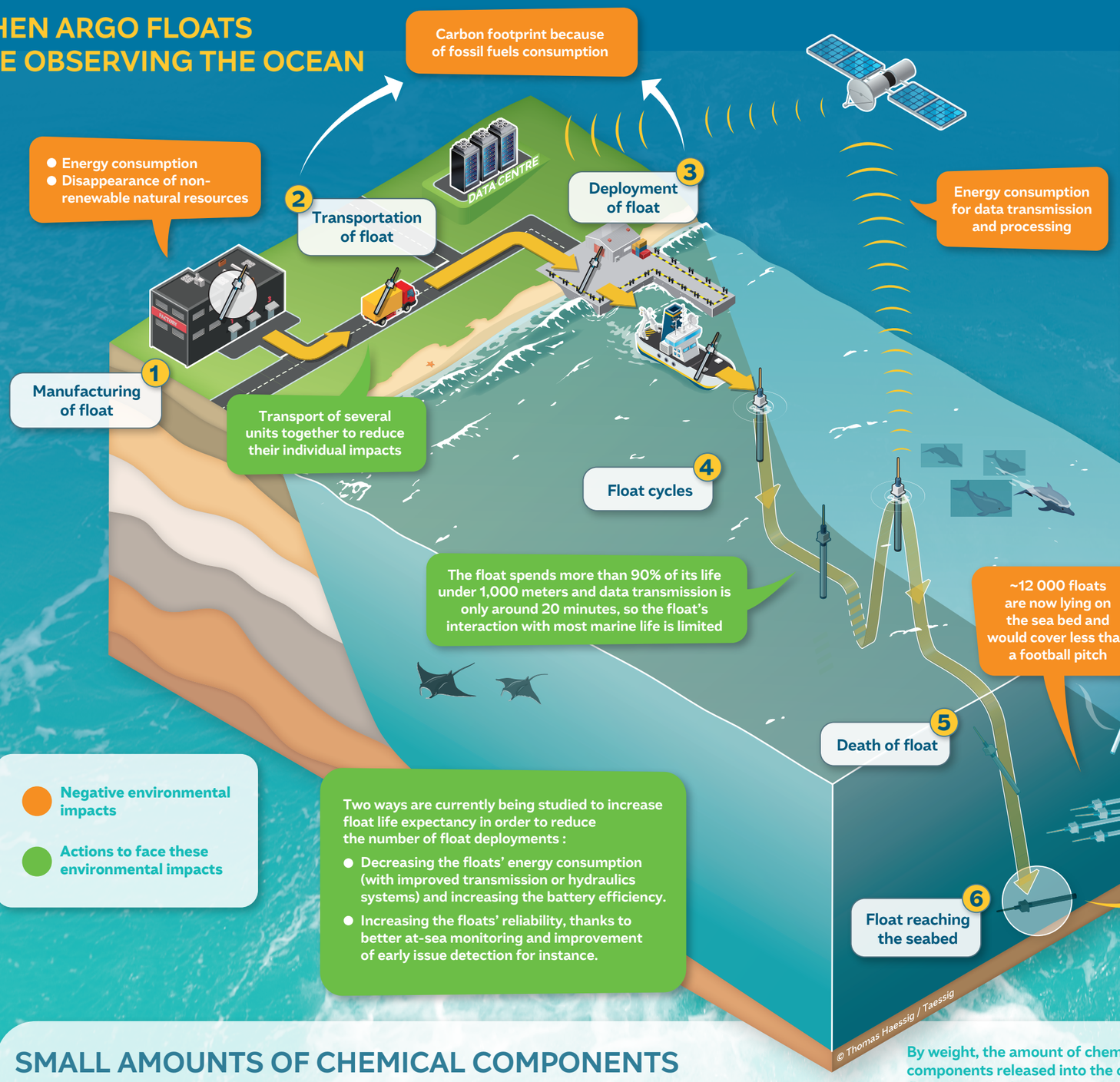
WHAT IS EURO-ARGO?

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

- The Euro-Argo ERIC is composed of 12 countries, and its coordination is managed by the Euro-Argo ERIC Office, hosted by Ifremer (France).
- The Argo international program's success is mainly due to the high degree of international cooperation behind the initiative and European partners have played a crucial role in setting up and developing the Argo network.

ENVIRONMENTAL IMPACTS OF ARGO FLOATS

WHEN ARGO FLOATS ARE OBSERVING THE OCEAN



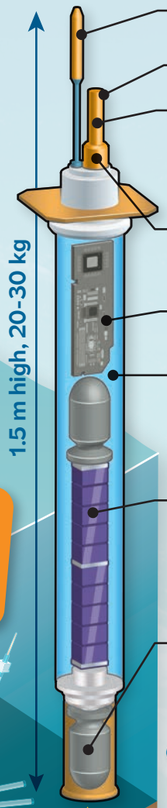
- Negative environmental impacts
- Actions to face these environmental impacts

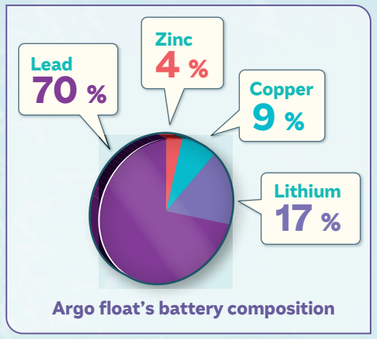
Two ways are currently being studied to increase float life expectancy in order to reduce the number of float deployments :

- Decreasing the floats' energy consumption (with improved transmission or hydraulics systems) and increasing the battery efficiency.
- Increasing the floats' reliability, thanks to better at-sea monitoring and improvement of early issue detection for instance.

WHEN ARGO FLOATS REACH THE END OF THEIR LIFE

When their batteries are exhausted, Argo floats can't reach the surface anymore and they drift in the ocean. At this point, sea water fills the hull and starts its corrosive action. The float eventually sinks to the seafloor, mostly over deep abyssal regions. Decomposition processes will take place over the course of a number of years.
Some elements from the battery will then spill to the surrounding sea water.





Argo float's battery composition

Recent developments to reduce the environmental impact

- New electronics with less rare metals
- Better choice of some electronics/mechanical components
- Optimisation of the profiler energy consumption, via the mechanical, electronic and software design
- Very high-capacity battery technology, which allows maximum energy storage in minimum volume
- Less and less polluting material
- Evolution towards no TBTO for every float
- The impact of dead floats can also be limited by using or designing recovery systems

SMALL AMOUNTS OF CHEMICAL COMPONENTS DILUTED IN THE OCEAN

Given the generally slow corrosion rates in the deep ocean, the speed of abyssal currents, the strength of nearbottom turbulence, and the large distances between floats (~300 km), a significant, local, short-term concentration of dissolved metal salts originating from a float seems unlikely.

The chemical species injected into the abyssal waters generally represent negligible amounts in comparison to the natural and anthropogenic fluxes of these substances. It would take over 176,000 years of Argo operations to inject the same amount of aluminum into the ocean that is employed annually to produce soda drink cans and a single year of the human contribution of plastic to the ocean is equivalent to 4.4 million years of the input from Argo.

By weight, the amount of chemical components released into the ocean by Argo floats is equivalent to:

COPPER: 90 kg ~80

ALUMINIUM: 17,000 kg ~70,000

LITHIUM: 180 kg ~65

POSITIVE IMPACTS ON THE ENVIRONMENT

Argo is a game changer in terms of ocean observations.
Argo floats collect about 120,000 surface-to-2,000 meters profiles of temperature, pressure and salinity per year.
Presently there is no method of observing the global subsurface ocean that is more cost effective and less environmentally damaging than Argo.

Designed by EURO-ARGO ERIC; Bibliography: "Environmental Issues and the Argo Array", Stephen C. Riser, University of Washington; Susan Wijffels, Woods Hole Oceanographic Institution and the Argo Steering Team