



The Euro-Argo Research Infrastructure and the Euro-Argo ERIC

P.Y. Le Traon, Ifremer, Euro-Argo coordinator

Euro-Argo ERIC inauguration
Brussels, July 17, 2014





Context

Main objectives of Euro-Argo





Why Argo and Euro-Argo ?

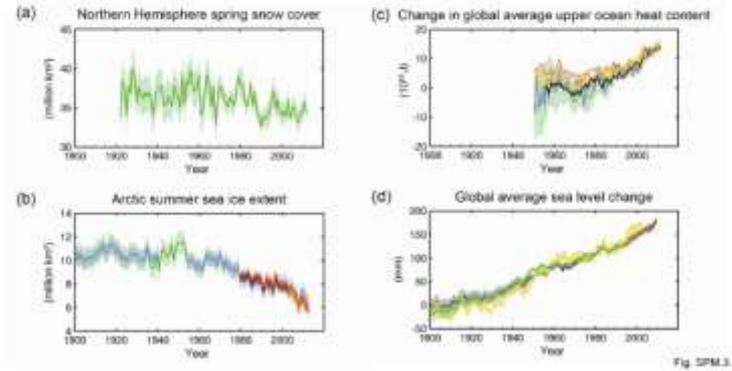
Warming of the climate system

Major role of the global ocean: heat storage, CO₂ absorption, long-term evolution of the climate system

Large impact in the oceans (physics, biogeochemistry, ecosystems)

Long-term global observations are essential

International cooperation is mandatory



Warming in the climate system is unequivocal

IPCC Working Group I
Climate Change 2007: The Physical Science Basis
ipcc
INTERNATIONAL PANEL ON CLIMATE CHANGE

The future oceans: biogeochemical challenges

The Future Oceans – Warming Up, Rising High, Turning Sour, Getting Deoxygenated

Warming up, Rising high, Turning sour, Getting deoxygenated

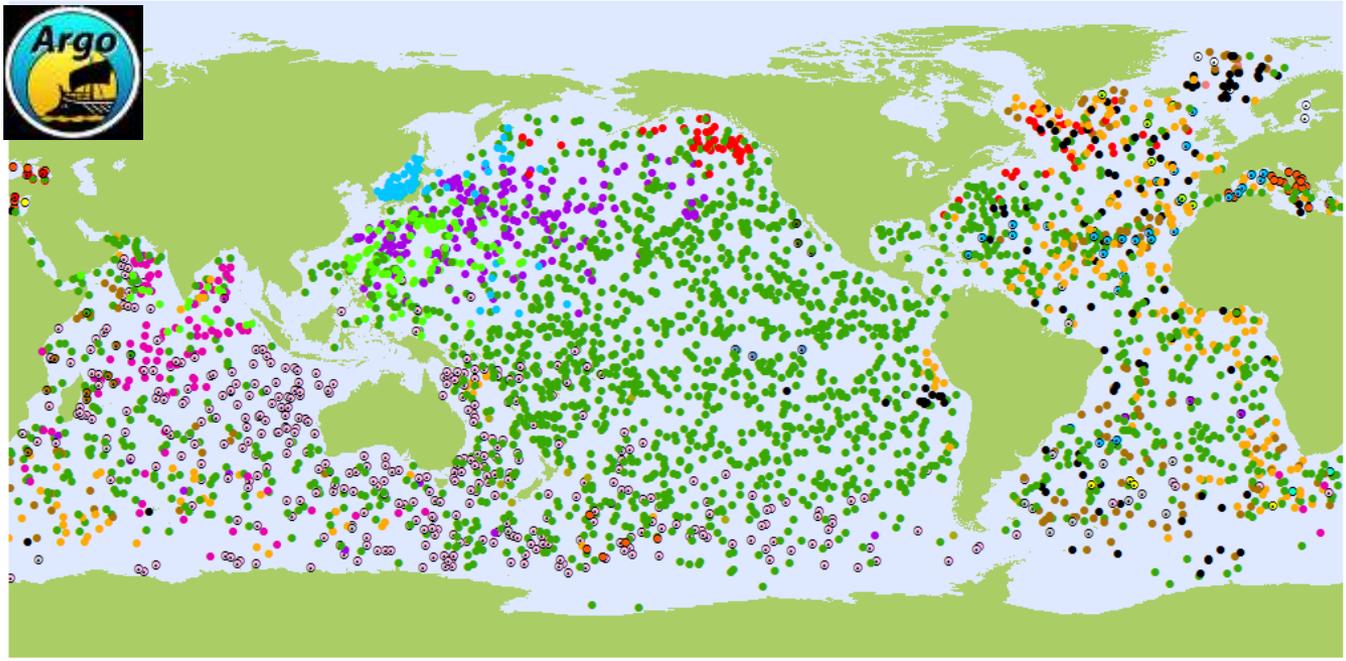
These drivers will stress marine biogeochemistry and ecosystems in a way that we only have begun to fathom.





Argo : a revolution in oceanography the first global real time in-situ ocean observing system

More than 3500 profiling floats worldwide measuring the temperature and salinity to a depth of 2000 m. A major contribution to the global ocean and climate observing system.



3603 Floats

ARGENTINA (4)	CANADA (71)	FRANCE (242)	INDIA (105)	KENYA (2)	MEXICO (3)	SOUTH AFRICA (2)	UNITED KINGDOM (148)
AUSTRALIA (377)	CHINA (111)	GABON (1)	IRELAND (7)	SOUTH KOREA (71)	NETHERLANDS (17)	SPAIN (30)	UNITED STATES (2 026)
BRAZIL (3)	ECUADOR (3)	GERMANY (122)	ITALY (29)	LEBANON (1)	NEW ZEALAND (11)	SRILANKA (1)	
BULGARIA (5)	FINLAND (6)	GREECE (3)	JAPAN (198)	MAURITIUS (3)	NORWAY (4)	TURKEY (4)	

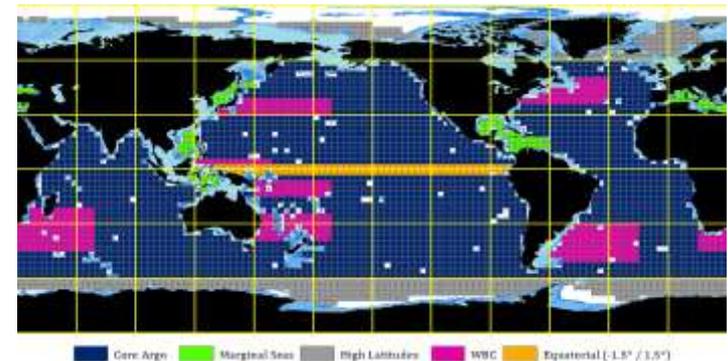
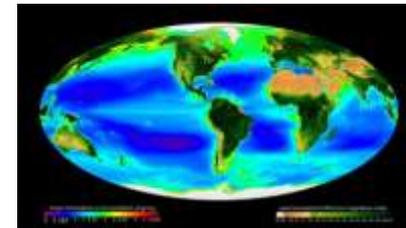
May 2014





Evolution of Argo for the next decade

- ❑ Proven concept. **Transition from research to sustained operational mode. 800 to 900 floats to be deployed per year.**
- ❑ Evolution of instrumentation (data transmission, hardware, lifetime).
- ❑ **The array needs to evolve over time. Extending the core mission.**
 - ❑ Under ice and high latitudes
 - ❑ Marginal seas
 - ❑ Sampling (e.g. western boundary currents, tropics)
 - ❑ Deep ocean
 - ❑ New sensors and Bio-Argo (Oxygen, Chl-a, Nitrate, Carbon) (+ pH)
- ❑ **Extension is on going** (pilot experiments) and long term plans are discussed.



~4200 float array





The Euro-Argo European Research Infrastructure



- Objective: ensure a long term European contribution to Argo
- Proposal: Europe establishes an infrastructure for $\frac{1}{4}$ of the global array
 - ✓ Deploy about 250 floats per year to contribute to the Argo core mission including regional enhancements (Nordic seas, Mediterranean&Black seas) (maintain an array of 800 floats).
 - ✓ Prepare and contribute to the extension of Argo (e.g. biogeochemistry, deep ocean, polar regions).
 - ✓ Users and applications: ocean and climate research and operational oceanography (GMES/Copernicus Marine Service).
- Set up a new European legal structure (Euro-Argo ERIC) that will allow European countries to consolidate and improve their contribution to Argo international.





History of the Euro-Argo Research Infrastructure development

- Discussion/preparation Euro-Argo proposal for the ESFRI roadmap : 2004/2005
- Part of the first ESFRI roadmap – 2006.
- FP7 Euro-Argo preparatory phase: 2008-2011
- Interim Phase (consortium agreement): 2011-2013
- May 2014. Creation of the Euro-Argo ERIC.



Three FP7 projects: Euro-Argo PP (2008-2011), SIDERI (2011-2012) and E-AIMS (2013-2015)





Our main objectives

*Strengthen, sustain and improve
European contributions to Argo*

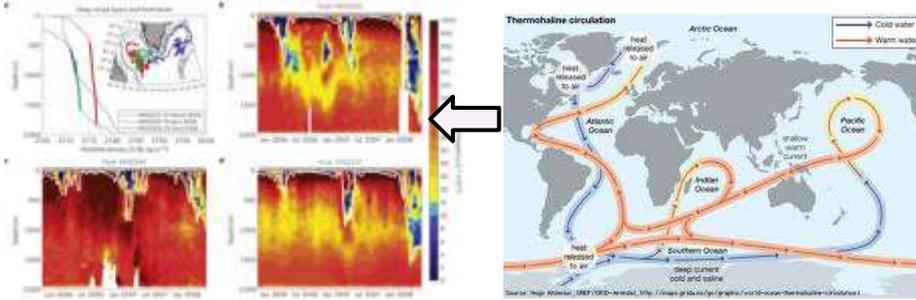
*Develop the use of Argo (integrated with other
elements of the global ocean observing system)
for ocean and climate change research and
operational oceanography*



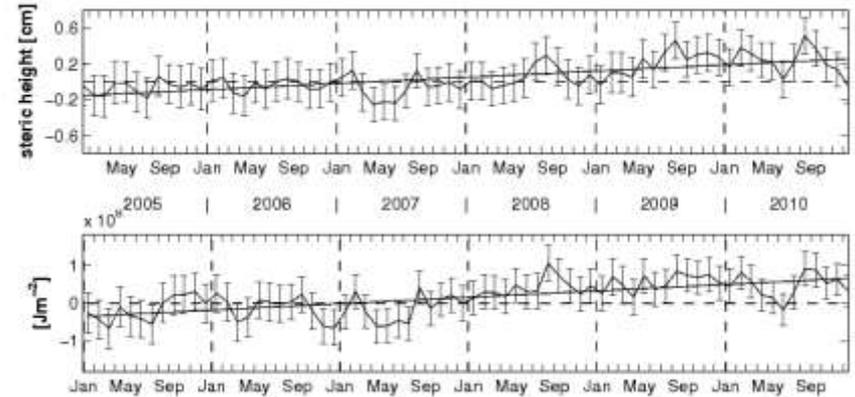


Ocean and Climate Change Research

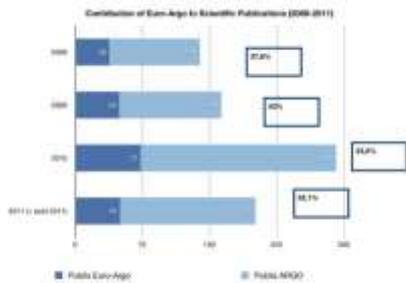
Europe has an active ocean and climate research community that heavily relies on Argo global array. Europe strongly contributes to Argo related research activities.



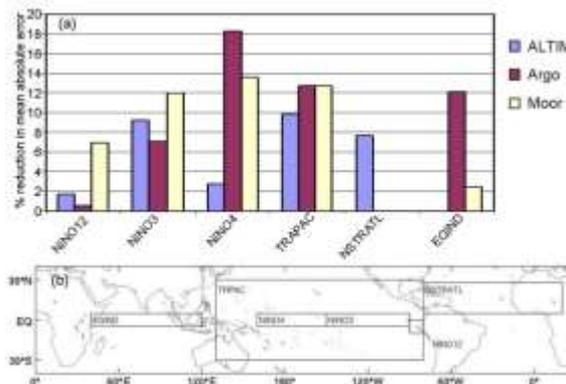
Argo floats in the Labrador Sea observing new deep convection event in Winter 2007/2008 (Vage et al., 2009)



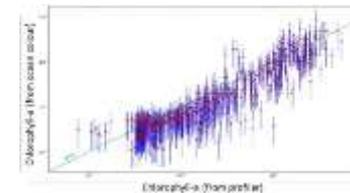
Global ocean heat content and mean steric sea level variations derived from Argo data (Von Schuckmann and Le Traon, 2011). Earth Energy imbalance studies.



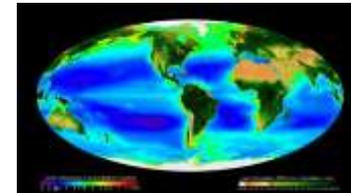
30 to 40% of Argo publications are from Europe



Impact of Argo observations for seasonal prediction (Balmaseda and Anderson, 2008)



Satellite validation and interpretation (ocean color, salinity, sea level, temperature)





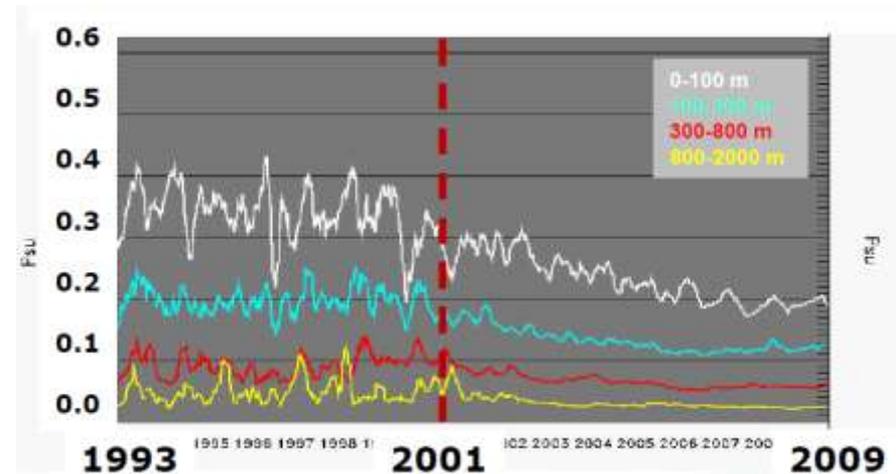
Euro-Argo is an essential component of the Copernicus Marine Service

Argo is the single most important in-situ observing system for the Copernicus Marine Service.

It delivers global data sets in a few hours that are critical/mandatory data for assimilation in ocean forecasting models.

Every 10 days, all Argo T & S profiles are assimilated in the MyOcean monitoring and forecasting centers. **Strong impact.**

Float technology is evolving to include new capabilities (e.g. biogeochemistry) that are essential to the Copernicus Marine Service.



Argo has contributed to decrease by 70% the salinity 7-day error forecast in the top 100m of the ocean (Mercator Ocean/MyOcean global model).





New scientific challenges: Bio-Argo example

Bio-Argo Science : global, climate change, perspective

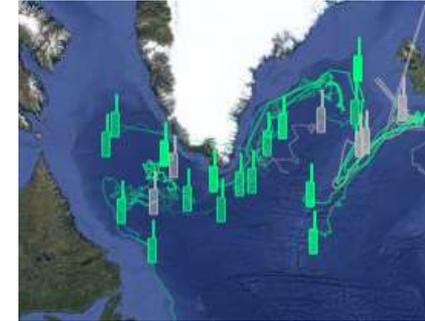
- Ocean acidification
- Ocean deoxygenation
- Carbon sequestration

Bio-Argo Implementation : we first target regional hotspots

- Oxygen Minimum zones
- North Atlantic sub-polar gyre
- Mediterranean Sea

Bio-Argo integration: a component of future observing and forecasting systems

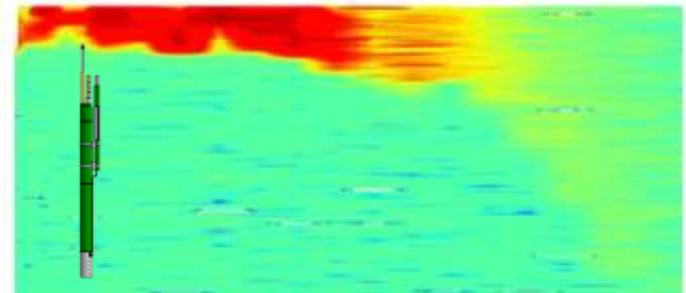
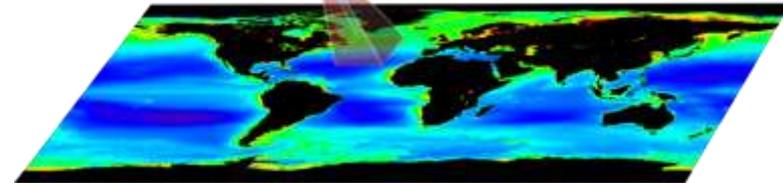
- Link with ocean colour remote sensing
- Link with biogeochemical & ecosystem models



FP7 ERC remOcean (2010-2016) Bio-Argo pilot experiment in the North Atlantic (PI: H. Claustre)



Satellite: Global scale



Bio-Argo profiling float: Vertical dimension





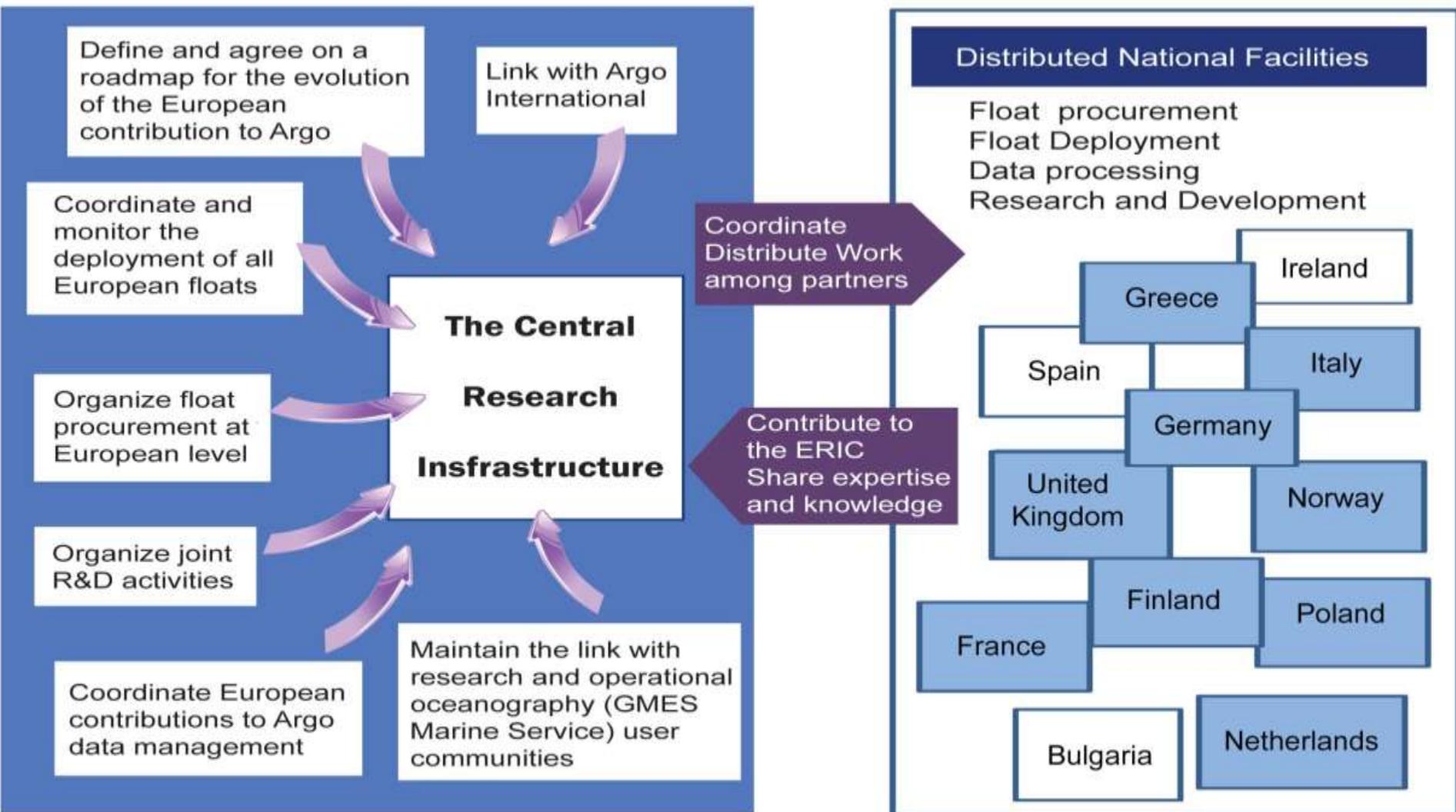
Organization and governance of the Euro-Argo research infrastructure





Organisation of the Euro-Argo RI

A central facility and distributed national facilities





The Governance of the Euro-Argo ERIC



Local Host for Euro-Argo ERIC
France (Ifremer, Brest)

Members: Finland, France, Germany, Greece, Italy, Netherlands, United Kingdom

Observers: Norway, Poland

Candidate Members or Observers : Spain, Ireland, Bulgaria (Portugal ? Turkey ? Sweden ?)

Argo International

The Scientific and Technical Advisory Group
(Advises on any scientific and technical matters)

Euro-Argo User Group



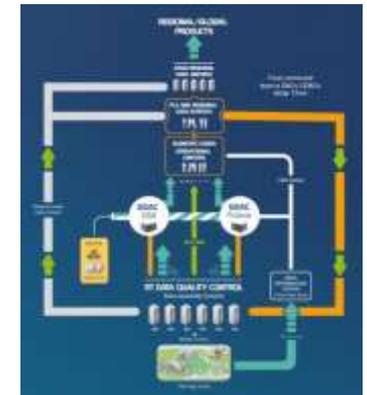


Euro-Argo contributions to Argo (1)



Initial contributions of different Euro-Argo ERIC countries have been defined/agreed (Annex of the Euro-Argo ERIC Statutes):

- Float procurement/deployment and personnel
- Contributions to the Argo data system (real time /delayed mode) (personnel)





Euro-Argo contributions to Argo (2)



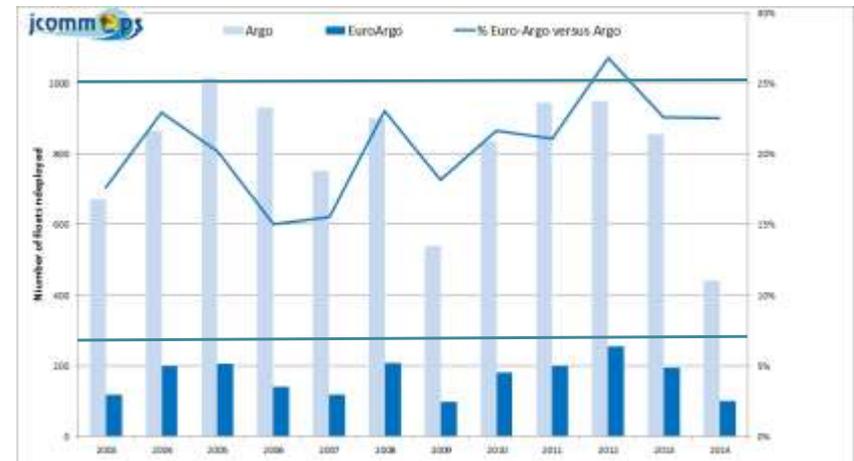
Over the past couple of years, **Euro-Argo contributions to Argo have regularly increased.**

Between **150 to 200 floats** are now **deployed per year** and the Euro-Argo array has reached a number of **about 600 active floats**

This is still **below our initial target (250 floats/year and 800 floats)** that will be reached when a long-term direct EU co-funding is set up.



Euro-Argo floats (blue) versus total Argo in May 2014



Euro-Argo floats deployed/year versus total Argo





Two phases for the Euro-Argo ERIC

- **2012-2014 (transition phase and phase 1 of the Euro-Argo ERIC)**
 - Light structure: 1 programme manager (25%), secretariat (25%). Ifremer personnel seconded to the ERIC
 - Funding by members and observers (national) (no EU funding for central coordination). EU funding through FP7 projects (e.g. SIDERI and E-AIMS).
- **2015+ (phase 2 of the Euro-Argo ERIC).**
 - Structure : 1 programme manager (50%), 1 or 2 engineer/scientist, 1 technician, (ERIC employees or seconded by members to the ERIC).
 - Funding by members and observers and the EU
 - 50 to 100 floats/year procured by the ERIC with EU funding. EU co-funding to consolidate the data processing and management system. To be organized through DG MARE (Emodnet, Copernicus).
 - Preparing/implementing the new phase of Argo (e.g. bio-Argo, deep Argo, Arctic) (national, Horizon 2020 projects, DG MARE).
 - Support the international structure (Argo Information Center/Jcommops).





Some of our priorities for the coming years

- ❑ Organize the functioning of the ERIC. New members/observers.
- ❑ Work with DG MARE to set up a long term EU contribution to Euro-Argo.
- ❑ Contribute to the global array and sampling of European regional seas.
- ❑ Consolidate the Argo data system (real time and delayed mode/climate).
- ❑ Continue working with user communities and expand our user base (e.g. scientific conferences, user training, user meetings). Maintain strong links with Copernicus and Emodnet.
- ❑ Prepare the implementation of the new phase of Argo at European level: deep ocean, biogeochemistry and Arctic.
- ❑ Integration of Euro-Argo with other marine research infrastructures: towards an European Ocean Observing System (EOOS).



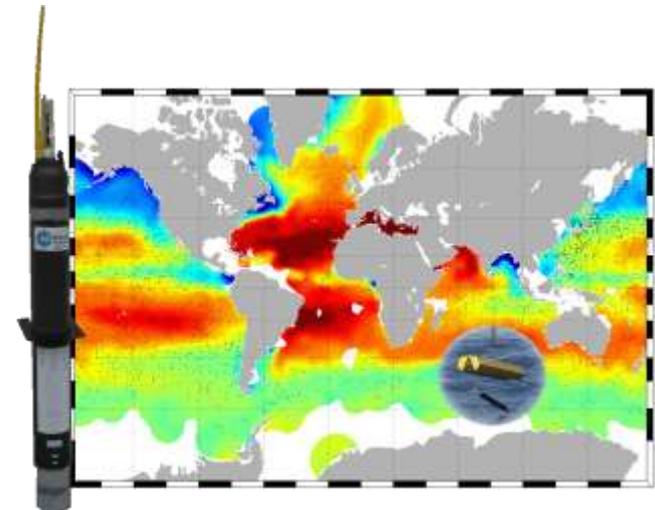
Conclusion



The very objective of Euro-Argo is to ensure a long term contribution of Europe to Argo

European level is needed : improved efficiency in all implementation aspects

- ❑ The Euro-Argo ERIC will allow EU member states to better coordinate, consolidate and improve their contribution to Argo international.
- ❑ There is now a common understanding that long term EU funding is required for such a global infrastructure. Should start in 2014/2015 through DG MARE (Emodnet, Copernicus).
- ❑ We now have an **excellent and unique tool and framework** to consolidate and improve a long term, sustained contribution of Europe to Argo. **Let's use it and do the best of it !**





Thanks to all Euro-Argo partners for their very good work and great European team spirit !

