

Euro-Argo: The European contribution to the global Argo ocean observations network



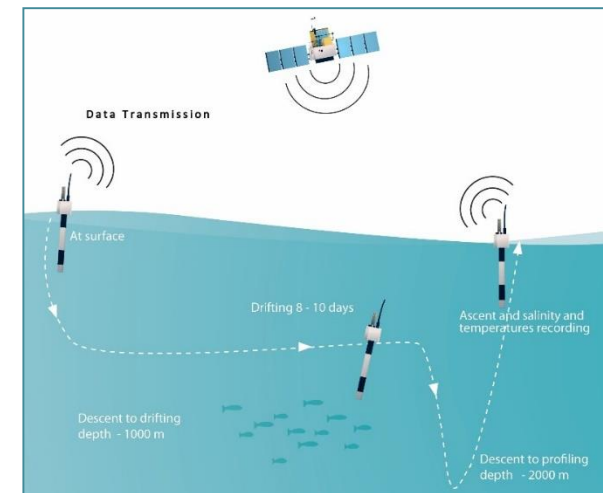
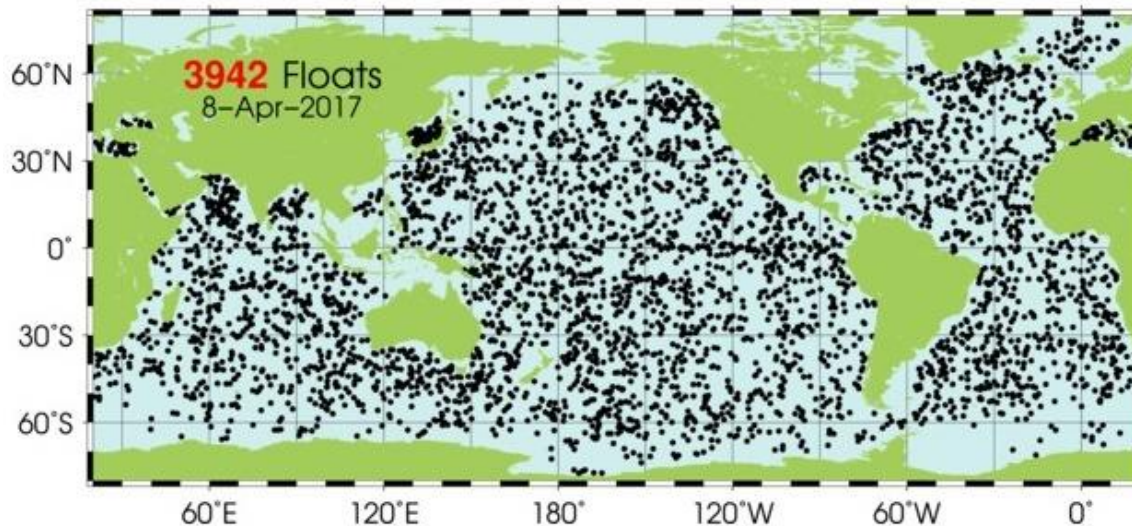
Claire Gourcuff, Justin Buck, Romain Cancouet, Hervé Claustre, Jari Haapala, Harmut Heinrich, Dimitri Kassis, Brian A. King, Birgit Klein, Gerasimos Korres, Guillaume Maze, Kjell Arne Mork, Grigor Obolensky, Diarmuid O'Conchubhair, Eleanor O'Rourke, Pierre Marie Poulain, Sylvie Pouliquen, Andreas Sterl, Virginie Thierry, Pedro Velez, Waldemar Walczowski.

EGU, Vienna 25 April 2017



Argo: global in-situ observing system

- About 4000 autonomous profiling floats are measuring ocean temperature and salinity up to 2000m depth, all over the globe
- The Argo network delivers essential data both for climate change research and for ocean analysis and forecasting systems



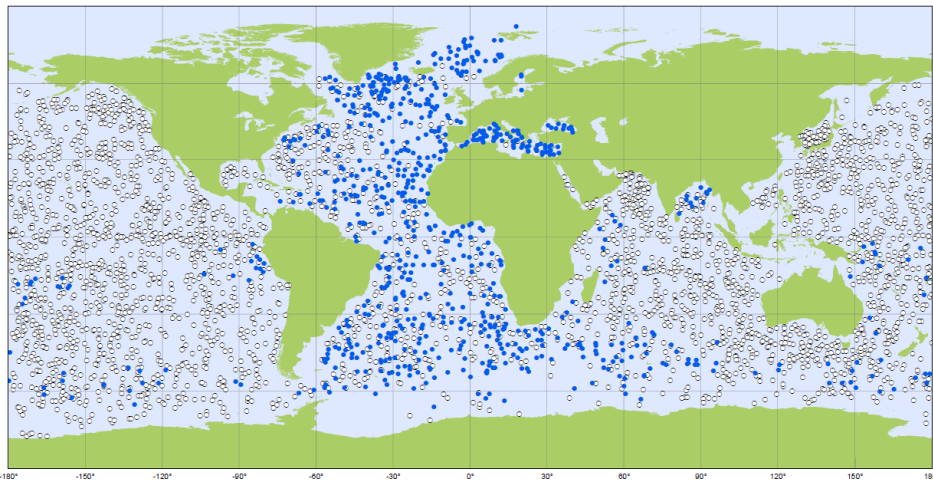
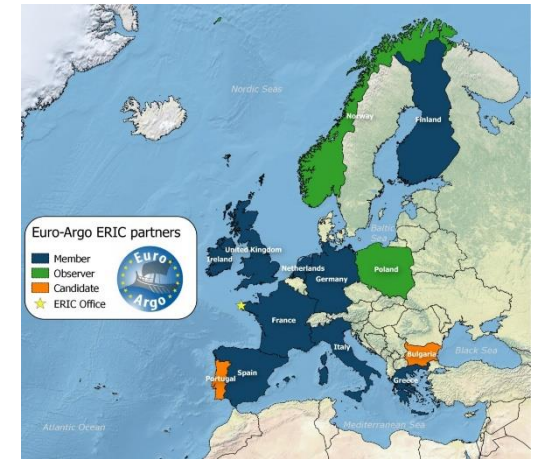


Euro-Argo Research Infrastructure



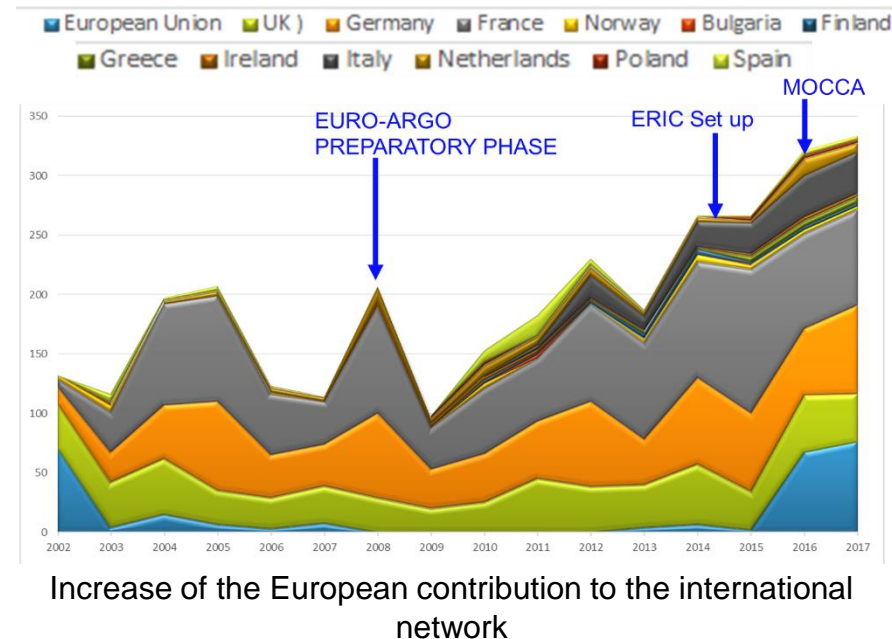
Objective : *Coordinate and sustain the European contribution to the global Argo network (1/4 of the network)*

- Euro-Argo was part of the 2006 ESFRI Roadmap
- The **Euro-Argo ERIC** (European Research Infrastructure Consortium) **was created in May 2014** with 9 members. Two additional members joined the ERIC in 2016-2017.
- Euro-Argo is a Landmark in the ESFRI 2016 roadmap



Argo
March 2017 active Euro-Argo floats
20% of the global array

• Argo EU (794) • Argo non EU (3142)





E-AIMS Project

FP7 EU Project

Coordination Ifremer [January 2013 - December 2015]



16 Partners (Euro-Argo, Copernicus Marine Service)

Overall objective: design and test of new float technology and impact for the Copernicus Marine Service

Prepare the evolution of Argo in Europe



SEVENTH FRAMEWORK PROGRAMME





Argo OSEs: innovation statistics

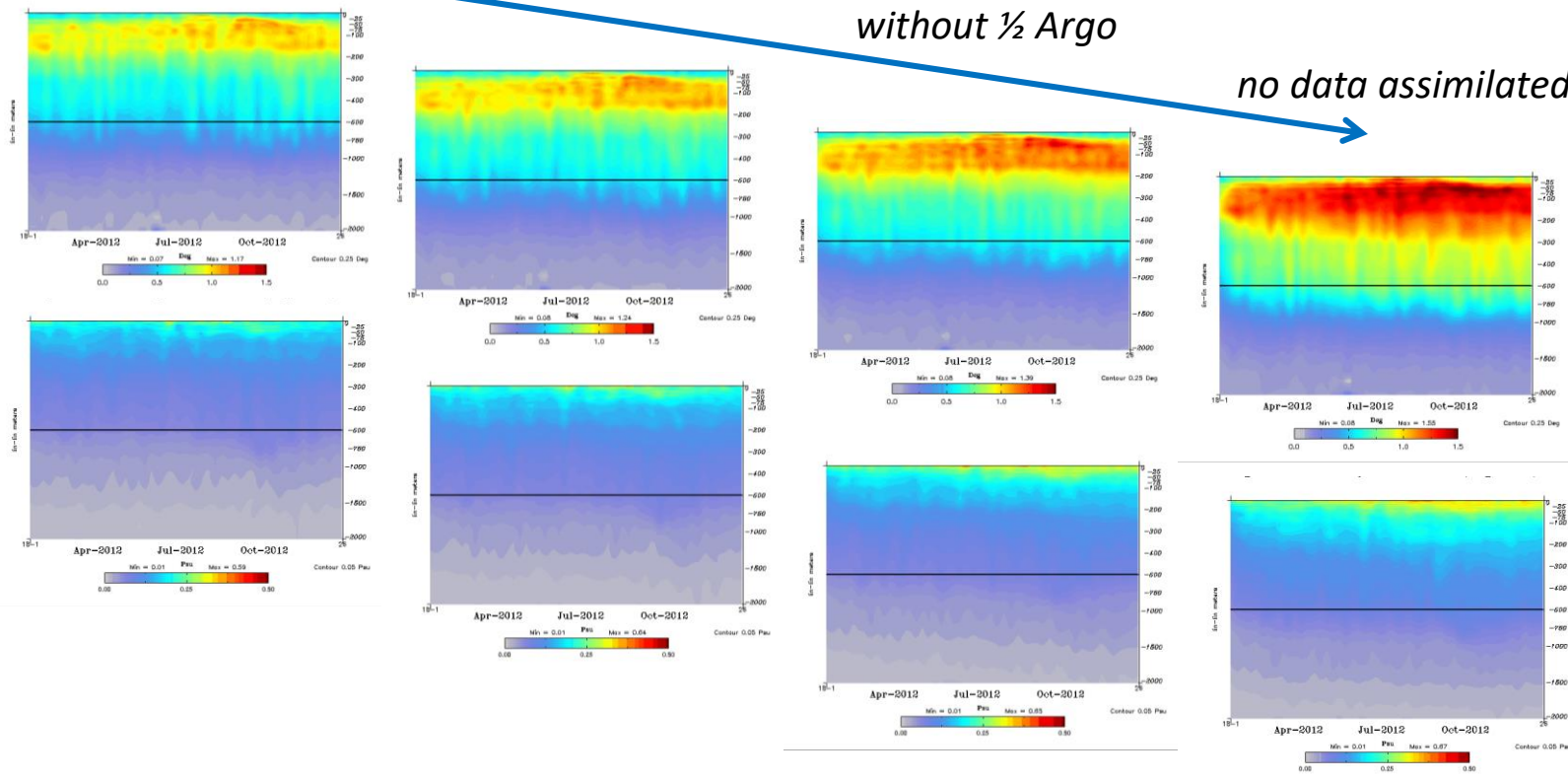
Impact of the Argo array on the global $\frac{1}{4}^\circ$ analysis system: observation minus model forecast misfits for all in situ T,S data in 2012.

Reference run

without Argo

without $\frac{1}{2}$ Argo

no data assimilated



**Global RMSE
for 2012 in
salinity and
temperature**



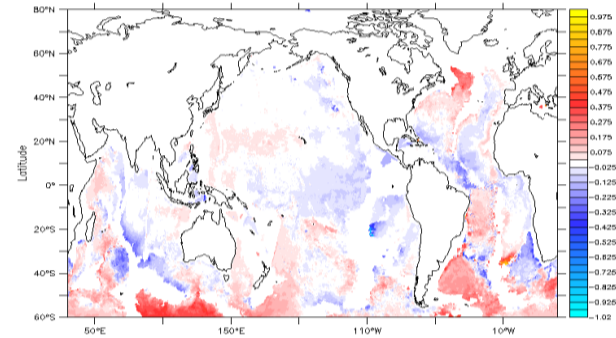
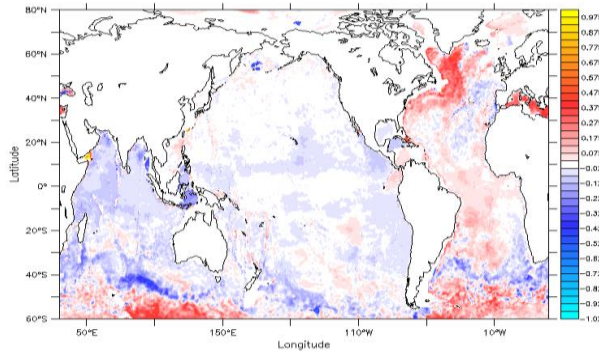


Deep Argo OSSEs: impact on analysed temperature

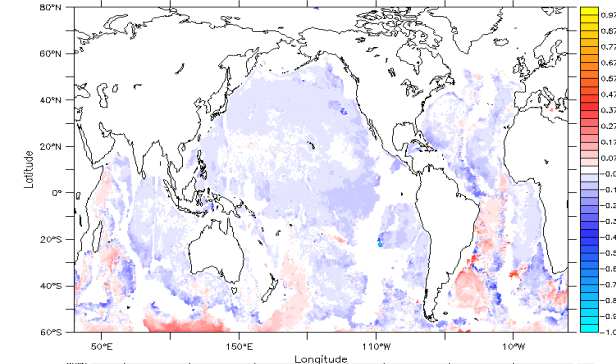
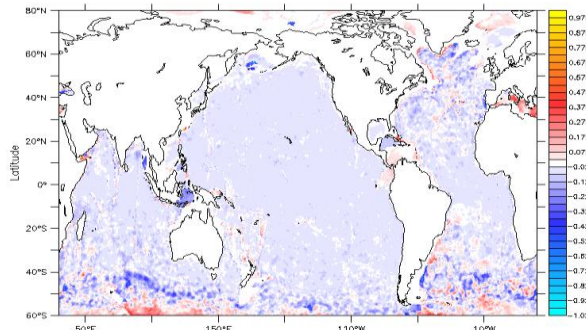
Mean temp. diff. 2000m-4000 m

Mean temp. diff. 4000m-6000 m

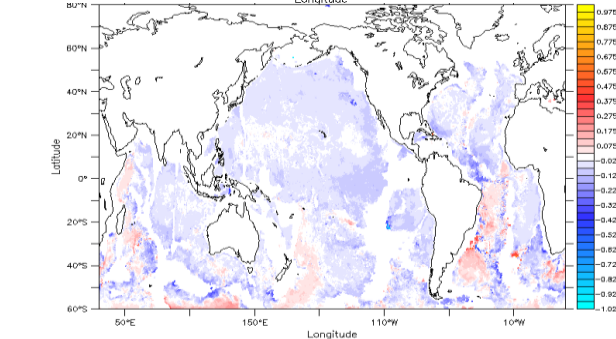
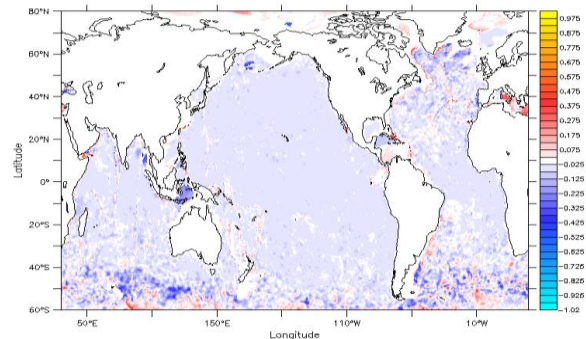
*Run with Argo
up to 2000 m*



*Run with 1/9 Argo
up to 4000 m*



*Run with all
Argo up to 4000 m*



Mean deep ocean temperature misfits in °C between the “truth” and different OSEs for different depth ranges.



Le Traon et al. 2015



Conclusions of E-AIMS



- Recommendations from E-AIMS OSE & OSSE:
 - The Argo array must be at least maintained at its present level of coverage and data quality to constrain CMEMS modelling and data assimilation system
 - Deeper (at least 4000 m) ocean measurements are required to constrain deep T&S model fields. Measurement with a coarse resolution (1/9) seems to be enough to constrain deep T&S model fields.
 - Development of BGC-Argo very much needed.
- New float BGC technology is mature
- Procurement, deployment and processing of new floats can be organized at European level
- E-AIMS conclusions lead to the writing of the ***“Strategy for evolution of Argo in Europe”*** document (Euro-Argo ERIC, 2016) - DOI: 10.13155/48526

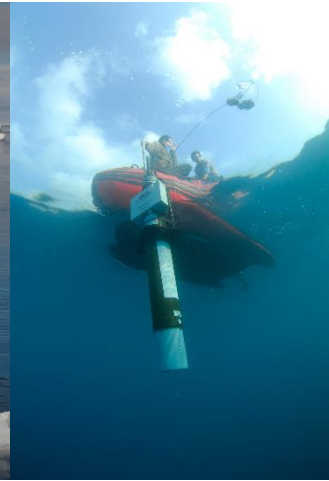




Argo in Europe for the next decade

Main Challenges :

- **Maintain** the Research Infrastructure
- **Extend** its capacity to abyssal ocean (4000 to 6000m), partially ice covered areas and biogeochemistry



Euro-Argo is developing the European strategy in coherence with the Argo one

- Sustain the core T&S mission, with an emphasis in Western Boundary regions
- Monitor European marginal seas (Baltic, Mediterranean & Black seas)
- Monitor high latitudes
- Monitor the abyssal oceans
- Monitor ecosystem parameters

Euro-Argo plans to contribute **to ¼ of the global network** and is now starting to implement the new phase of Argo.

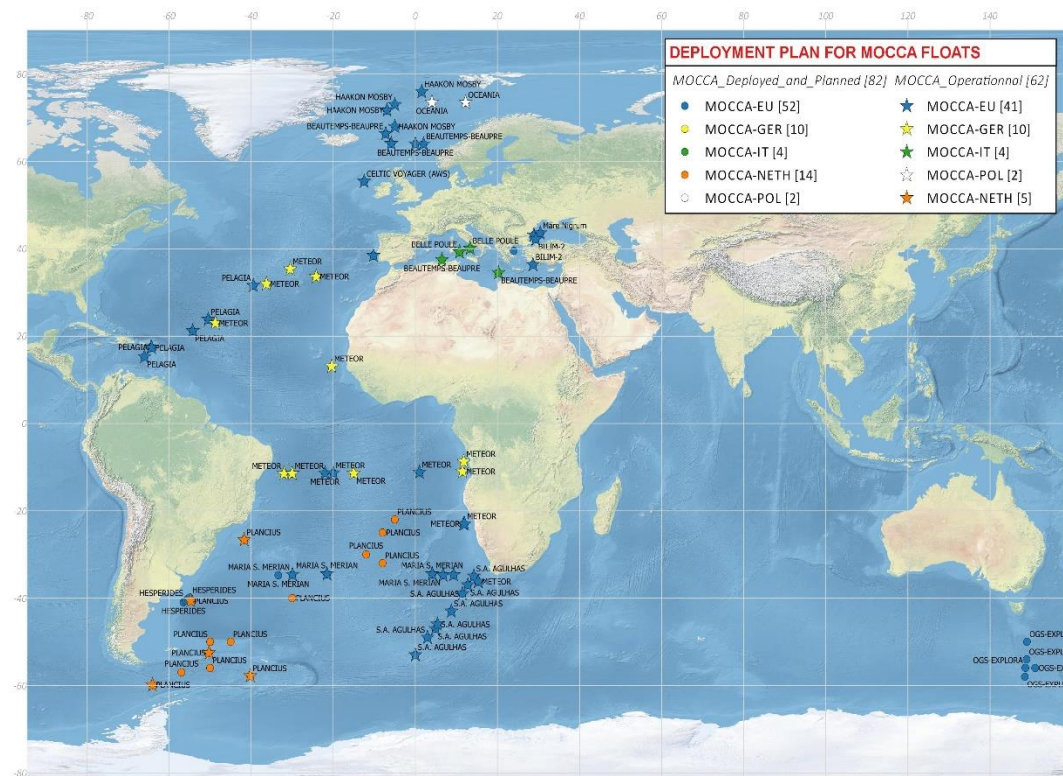




Core T/S Argo mission & marginal seas

- National contributions
- EU contribution: MOCCA project (*Monitoring the Oceans and Climate Change with Argo*)

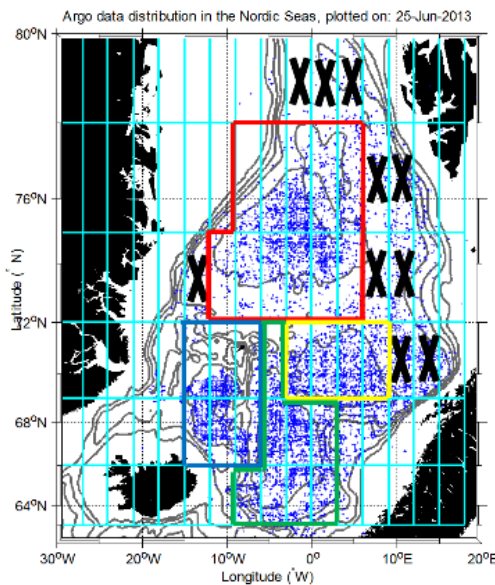
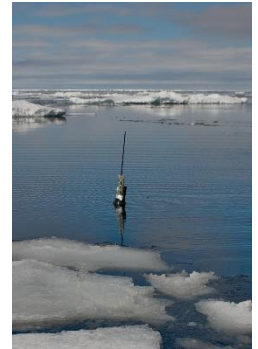
- [2015-2020]
- DG-MARE (EASME grant)
- 150 T/S floats
(20% co-funded with Euro-Argo members/observers)





High Latitudes

- Argo is a complementary technology to other platforms, like Ice Tethered Platforms (ITP) in the Arctic, sea mammals, vessels and mooring in Arctic and Antarctic areas
- Technology has been proven in Weddell Sea with floats able to stay for a long period under ice located with acoustic sources and is under testing in the Arctic in Baffin bay (NAOS project)
 - Collaboration opportunities within INTAROS project (acoustic sources)
- European Argo strategy in the Nordic Seas:

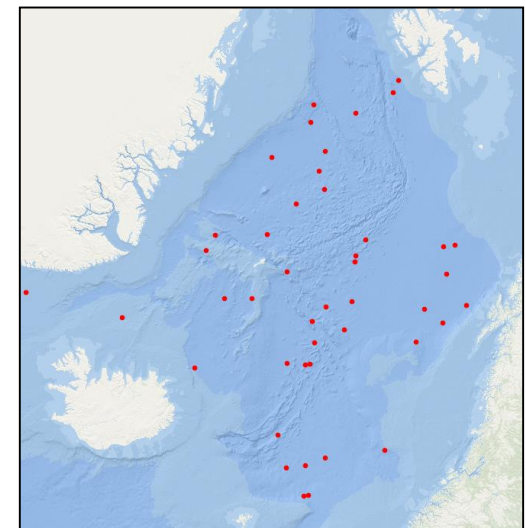


Target:

10 floats in boundary currents

29 floats in deep basins:

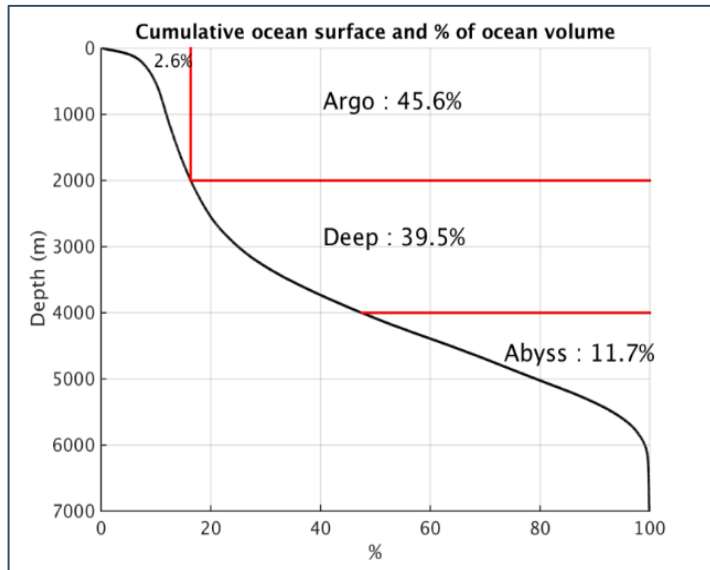
- red – Greenland Sea,
- blue – Icelandic Plateau
- yellow – Lofoten Basin
- green – Norwegian Basin.



21 April 2017: **44 active floats**
including **8 BGC floats**



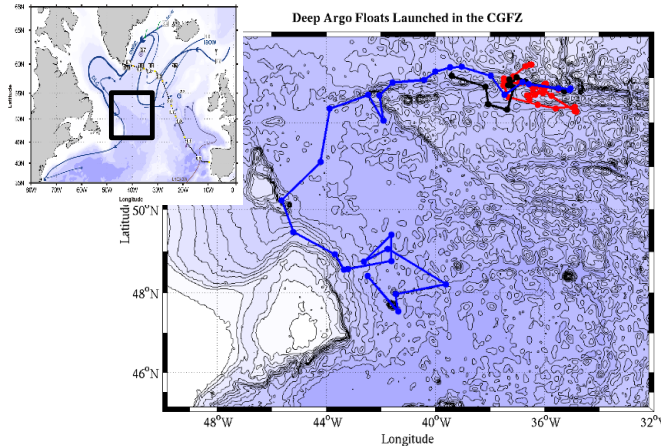
Argo extension to depth



Le Reste et al. (2016)

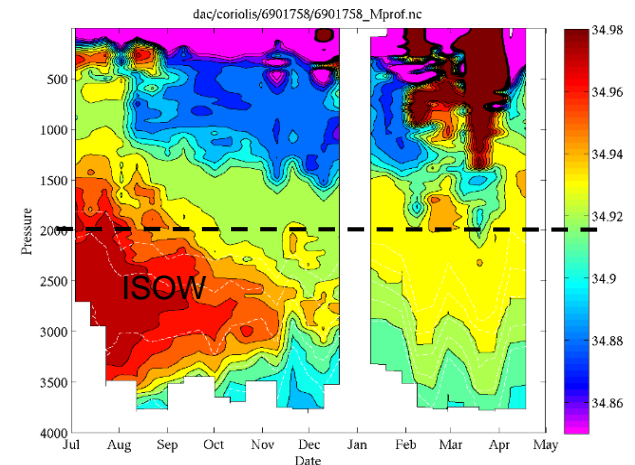
- Argo floats (0-2000m depth) give access to ~50% of the global ocean volume
- Deep Argo floats (0-4000m depth) give access to ~90% of the global ocean volume

Strategy for Deep Argo: Focus on areas where large deep signals are located, that is where deep-water masses are formed, namely the North-Atlantic Ocean and the Southern Ocean



Courtesy of
G.Maze & V.Thierry

Southward trajectory of the deep Argo float 6901758 (blue) between deployment (July 2015) and May 2016





Biogeochemical Argo

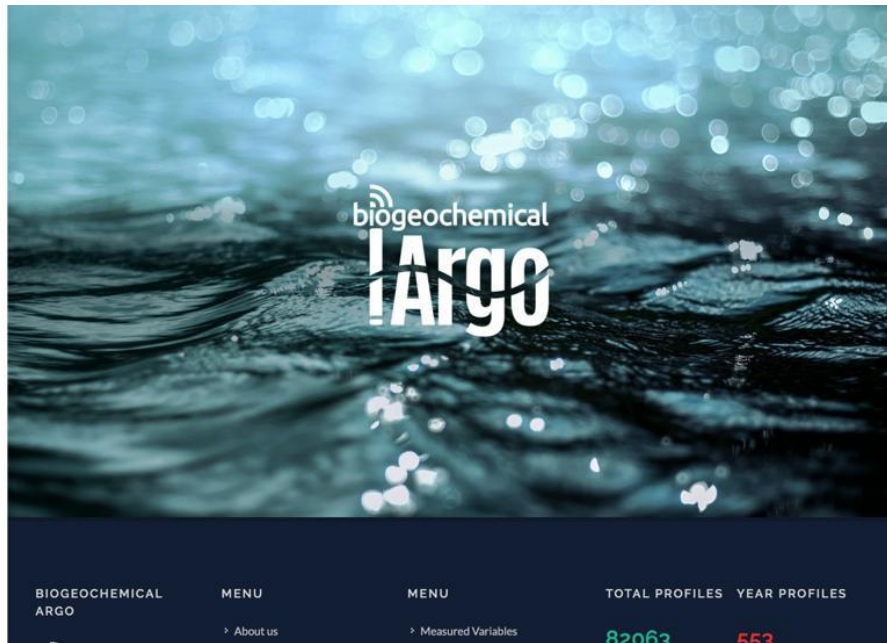
- Biogeochemical-Argo *Scientific and Implementation plan* was finalized this year
 - See dedicated presentation: Hervé Claustre & Ken Johnson
“*Biogeochemical-Argo: achievements, challenges for the future and potential synergies with other components of ocean observation systems*”
(OS3.1/BG9.69 session, Thursday afternoon)

<http://biogeochemical-argo.org/>



SCIENCE & IMPLEMENTATION PLAN

- ABOUT US
- PROGRAM LIFE
- SCIENTIFIC QUESTIONS
- MEASURED VARIABLES
- KEY AREAS & PROJECTS
- DATA
- LIBRARY
- DISSEMINATION
- FLOAT MAP & STATISTICS





Conclusions & perspectives



- The importance of Argo for the Copernicus Marine service was proven through E-AIMS
- Recent R&D studies conducted at European level have shown that Biogeochemical Argo technology are mature
- the Deep technology pilot development phase is still ongoing to reach the accuracy needed for climate applications
- Euro-Argo has successfully started to organize procurement, deployment and processing of new floats at European level
 - Coordination of national activities
 - European floats (MOCCA project)
- Euro-Argo has started to implement the new phase of Argo, following the *“Strategy for evolution of Argo in Europe”* (Euro-Argo ERIC, 2016)
- Work is ongoing regarding sea-ice technology that will enable Euro-Argo to extend its capacity to high latitudes

Note: Euro-Argo is participating in the ENVRI community booth, located in the Exhibition Entrance Hall Yellow level 0 (ground floor), Stands 02-03.

