A glider component for the GOOS

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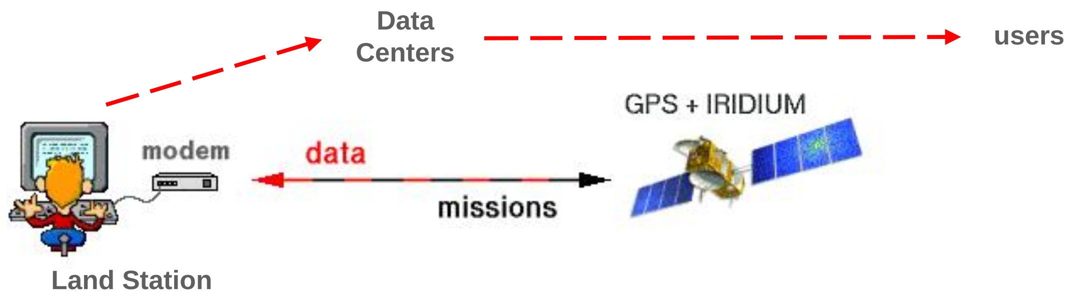
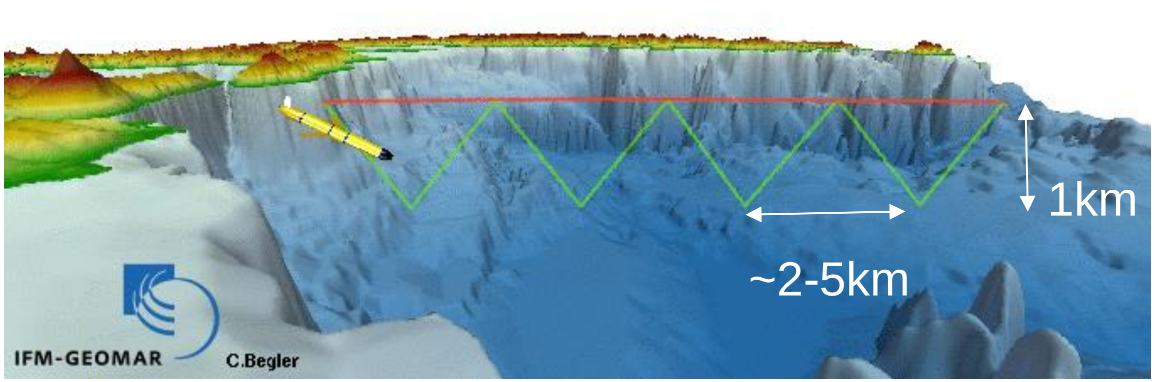


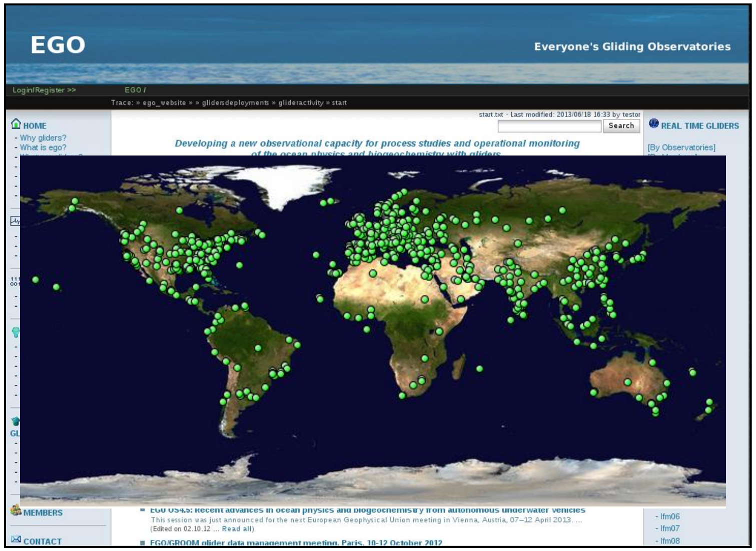


United Nations Educational, Scientific and Cultural Organization

IOC Sub-Commission for the Western Pacific (WESTPAC)

EGO: a glider community (sci & tech)

Everyone’s Gliding Observatories
Australia, Canada, Chile, Egypt, EU, Israel, Mexico, Peru, South Africa, USA,…   (academy+manufacturers)



- **EGO meetings & Glider Schools** since 2005; now 100-150 people

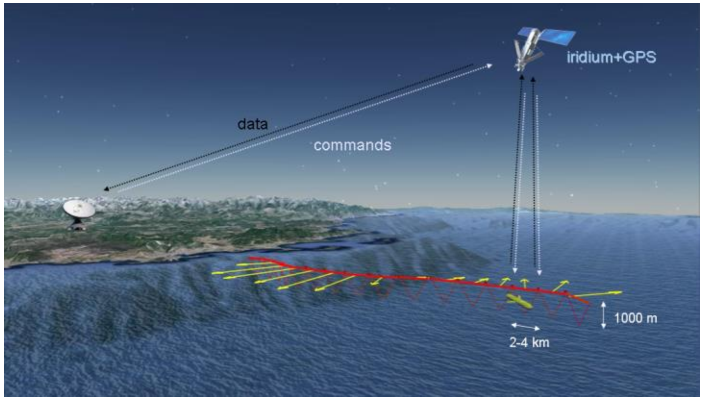
- **Showcase EGO website** http://www.ego-network.org
(10,000 unique visitors and 100,000 pageviews per year)

- **Coordination** (best practise, data management, international experiments)

- **OceanObs’09 White Paper** *Testor et al., 2010*

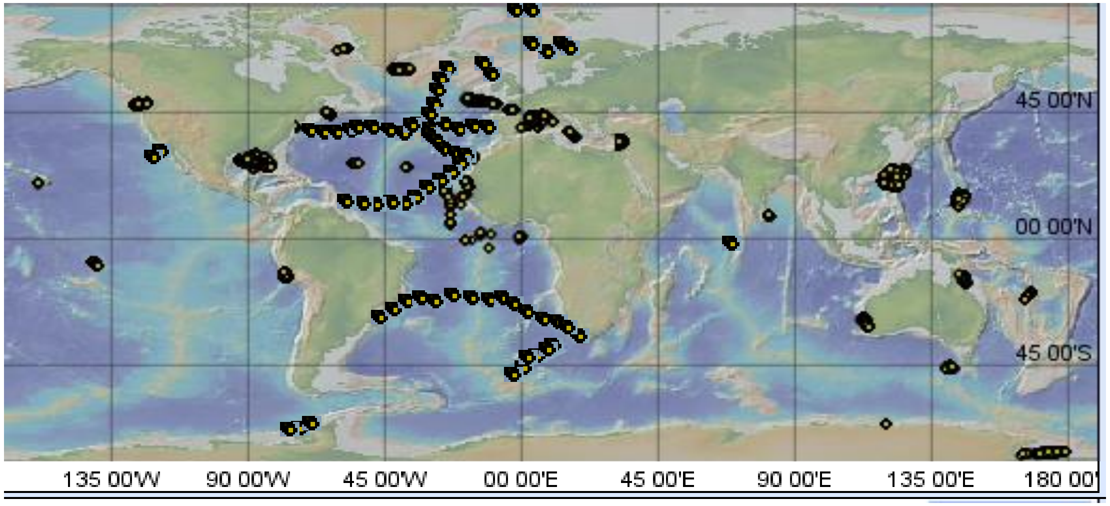
→ need for a glider component in the GOOS, recommendations
- ✓ formation of the global glider system,
- ✓ adoption of best practice, standards and a “Argo” like data system
- ✓ setup of a network of shared resources and expertise,
- ✓ common and accessible portal for glider data.

A global glider network



Challenge: "gliderports" (infrastructures) distributed all around the world

Deployment, piloting, recovery, maintenance, data management and analysis



Coordination

Support from
EGO COST Action
EU FP7 GROOM
National projects

A decade of glider data (2004/09 – now) on the GTS
226243 profiles, 113 platforms
> 200 scientific articles

→ process studies & sustained observing programs
(often in conjunction with other platforms)

International framework for sustained glider observations

→ Discussions at JCOMM Obs. Coordination Group meetings (OCG-5 & 6)
→ Formation of international (EGO) Glider Steering Team (GST) and Data Magement Team (GDMT). To be approved by JCOMM at next MC.

- **ToRs**
- **Membership and governance**
- **Monitoring of the network**
- **Scientific international program**
  - Provide unaliased physical and biogeochemical time series in key areas (water formation areas, upwellings, boundary currents, straits, shelves, biogeochemical provinces) and information about the processes
  - Study the links between the regional and global systems, and interconnections

GST

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Johannes Karstensen, GEOMAR, Germany
Elena Mauri, OGS, Italy
Peter Haugan, UIB, Norway
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Mark Inall, SAMS, UK
Scott Glenn, Rutgers Univ., USA
Dan Rudnick, SIO, USA
(Brad de Young, Mem. Univ, Canada)
(Seb Swaart, UCT, South Africa)

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Erik Magnus Bruvik, UiB, Norway
Charles Troupin, SOCIB Spain
Justin Buck, BODC, UK
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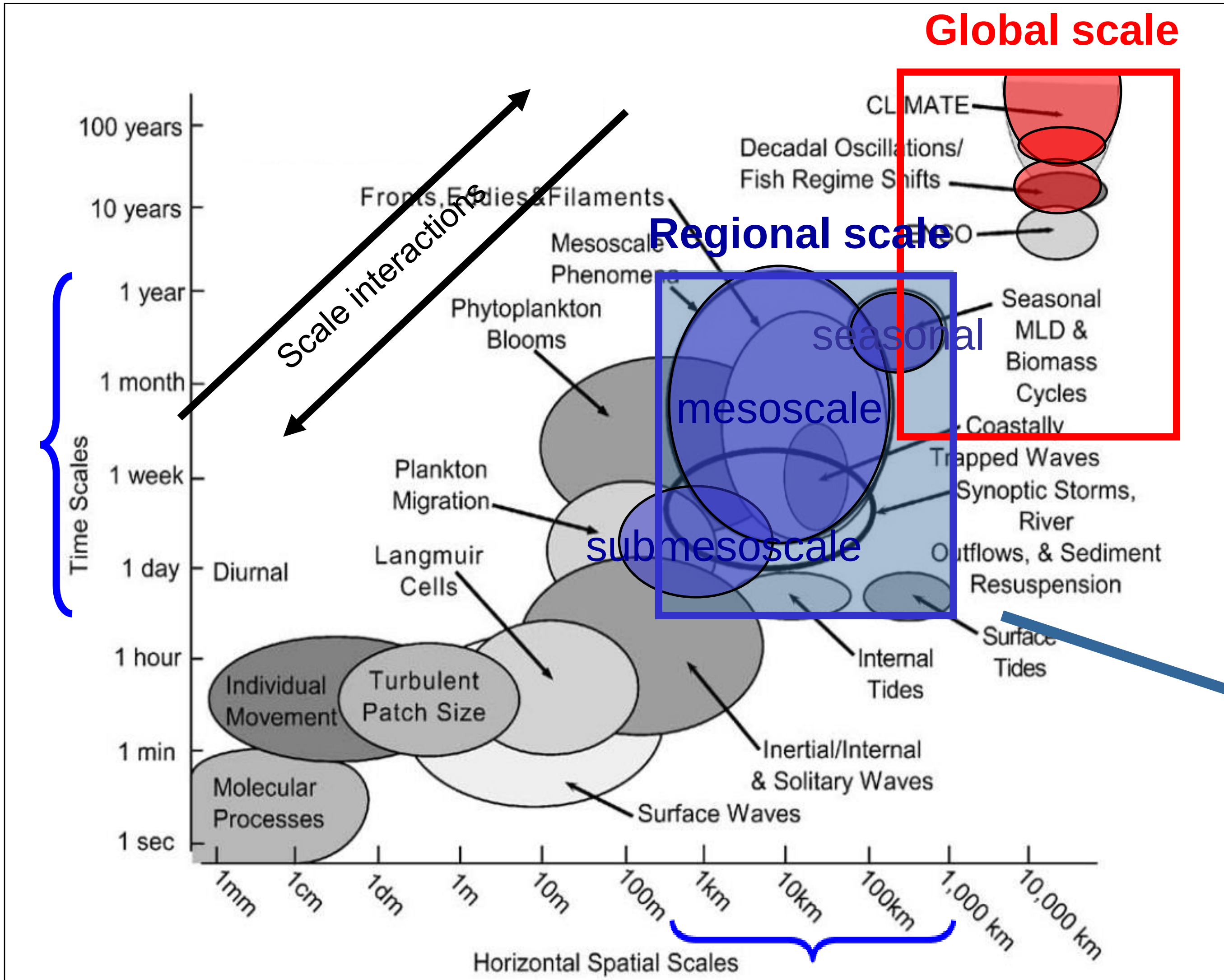
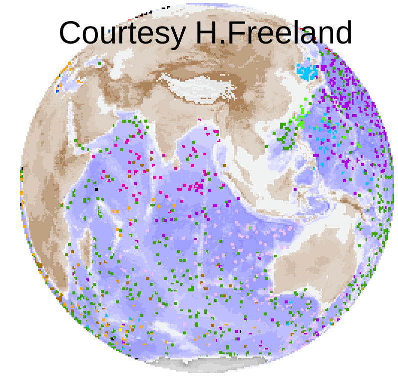
Evolution of the GOOS

- Essential Ocean Variables: physical, biogeochemical
- Extension to regional seas and coastal ocean



Courtesy H.Freeland



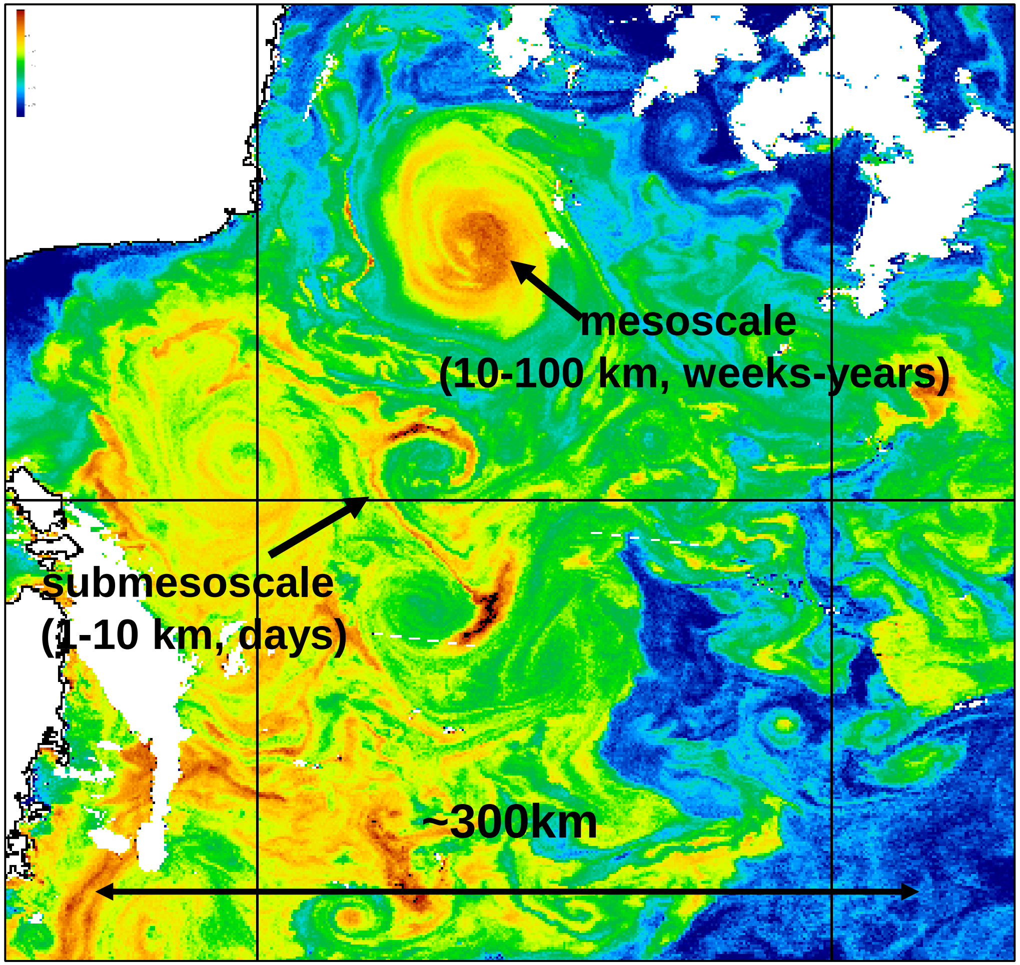
The present GOOS can be considered to have a resolution of 300km and 10 days (Altimetry/Argo; climate-oriented)

Regional/coastal zones

→ more societal applications (green, blue growth,…)

Physical and biogeochemical variability at regional scale

Satellite image sea color - surface Chl-a



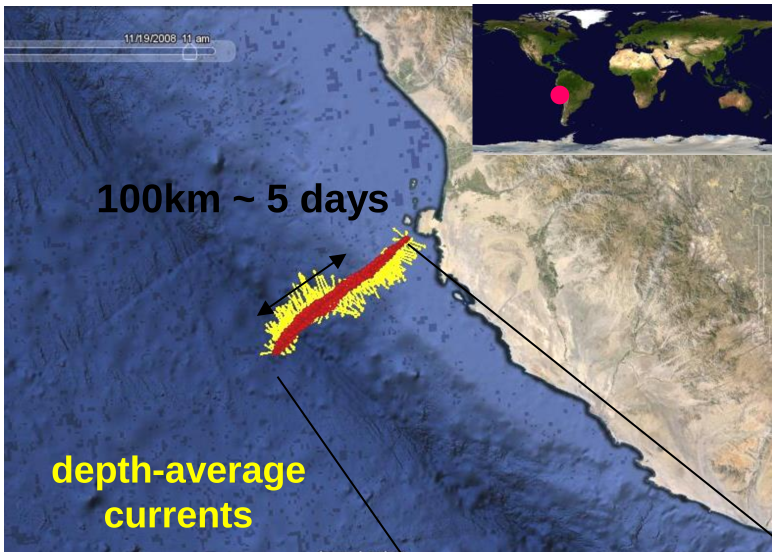
Need for better characterization of the **vertical structure** of the ocean (satellites only describe the surface)

- for **physical** and **biogeochemical** variables
- and at **(sub)mesoscale** to avoid erroneous conclusions on regional and coastal areas due to aliasing effects ⚠

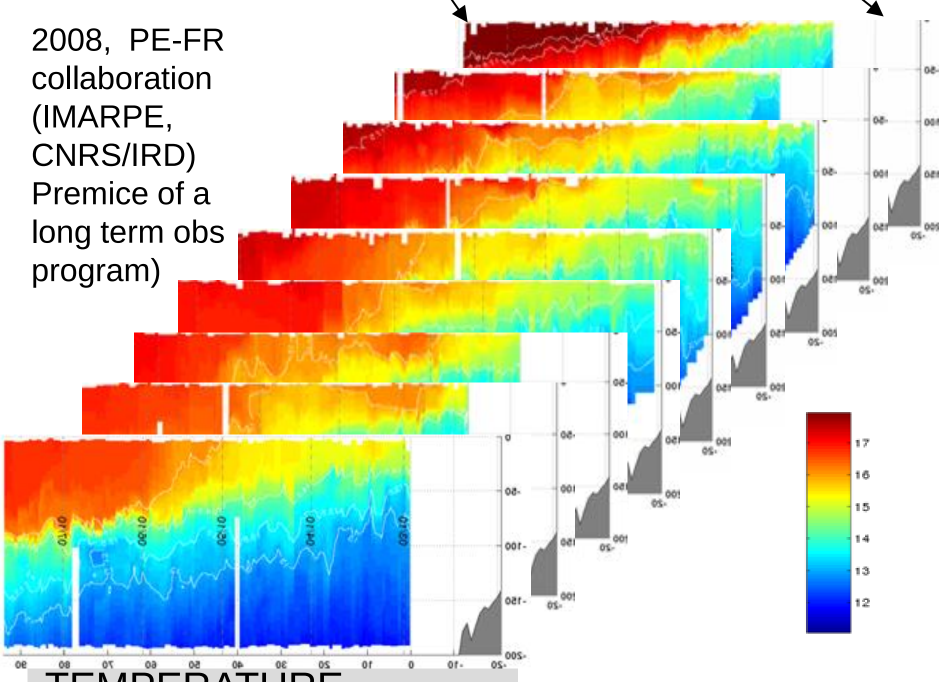
in situ observations: generally too coarse (time or space) or with poor coverage (duration)

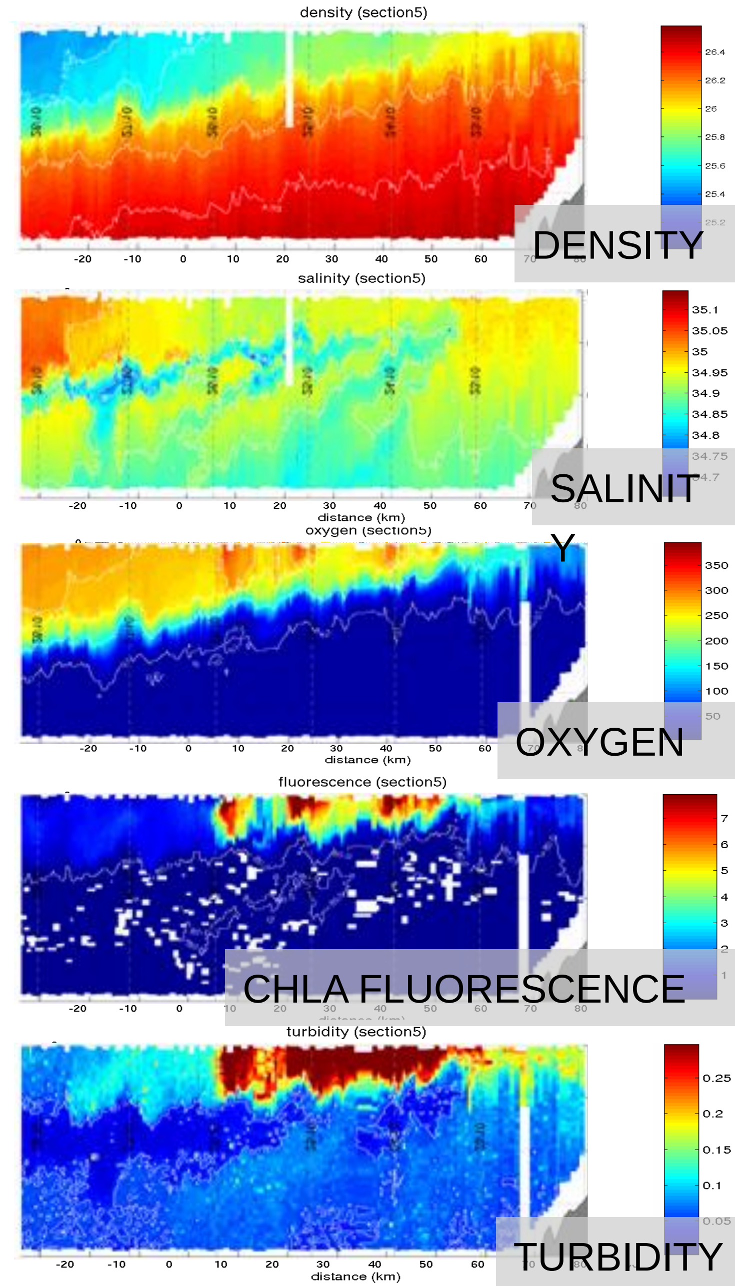
→ gliders cover a wide range of scales and provide a cost-effective solution to fill this gap

Fine description of an upwelling system

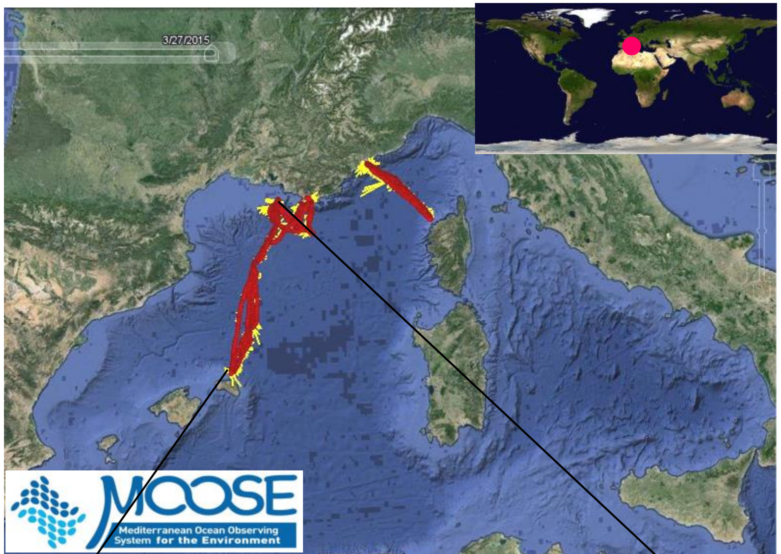


2008, PE-FR collaboration (IMARPE, CNRS/IRD) Premice of a long term obs program)

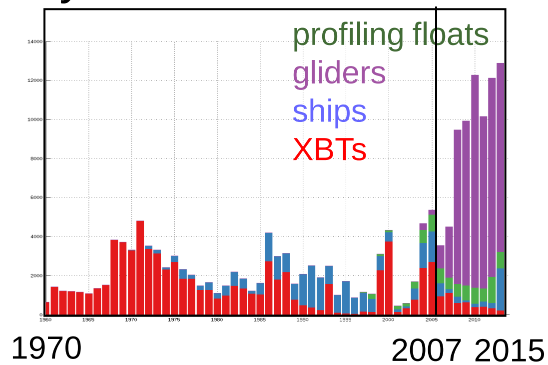


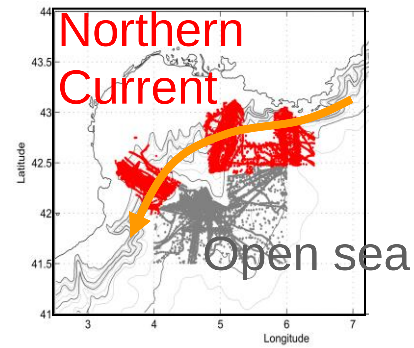


Sustained observations at the regional scale



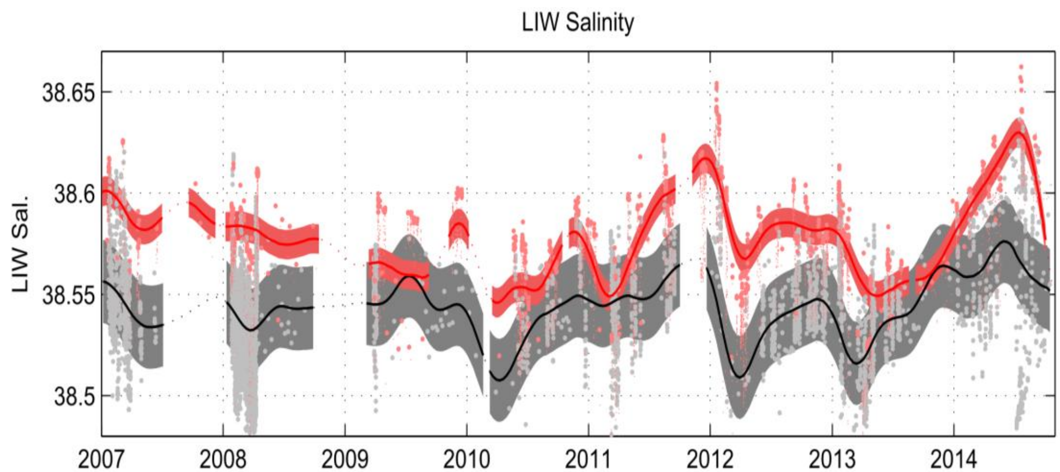
Nb of profiles per year in the NWMED





→ Synoptic description of provinces

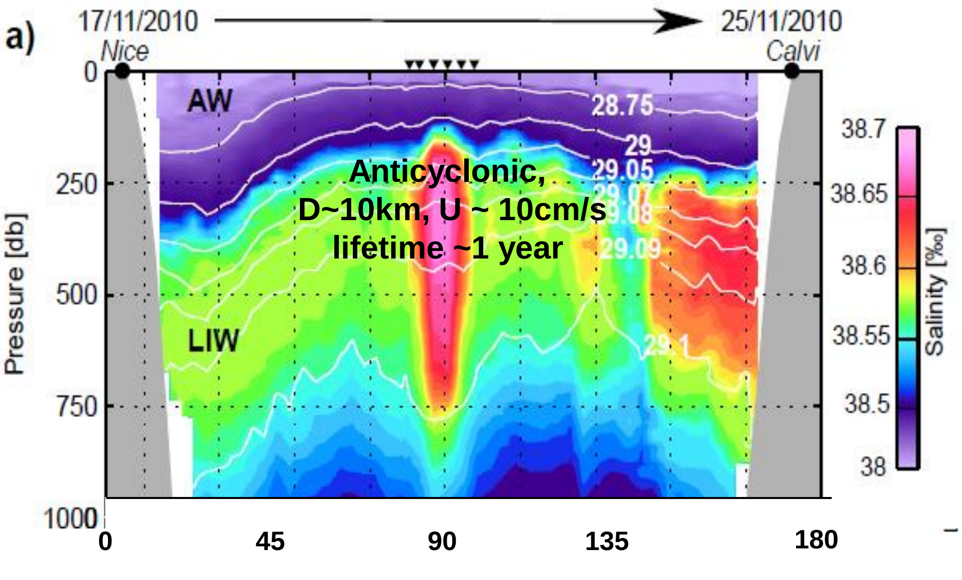
→ Variability indices



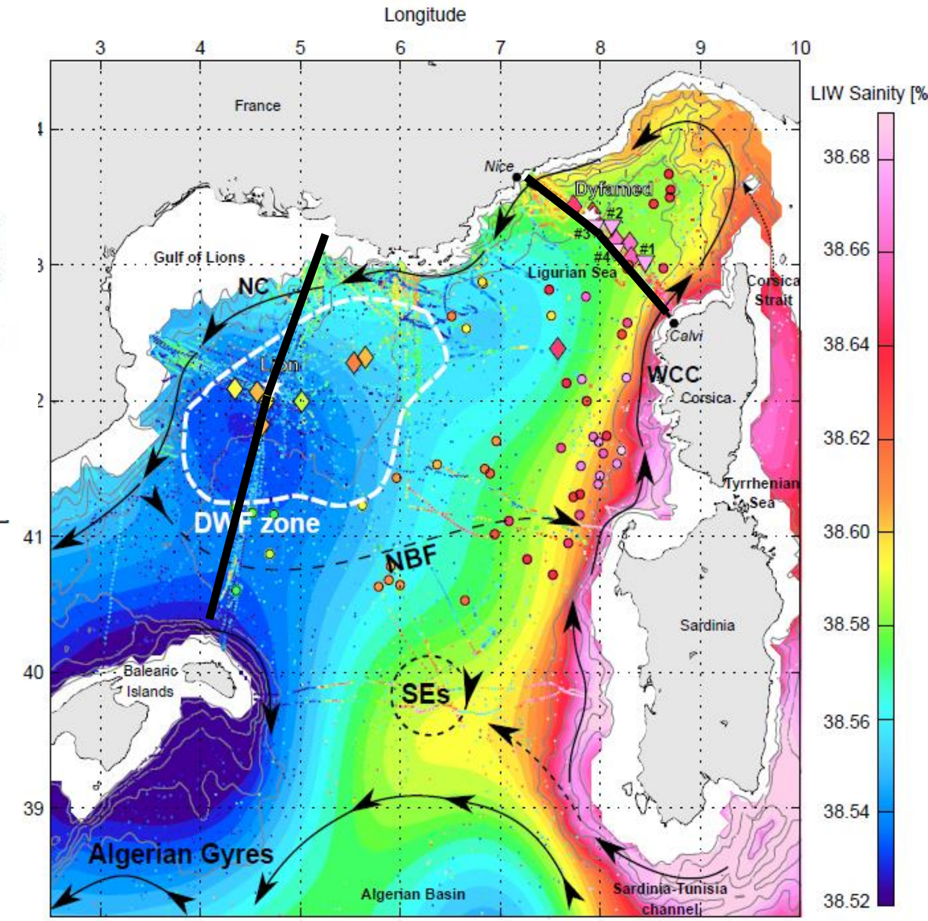
Abrupt changes detected

Reliable confidence intervals

The preponderant role of Submesoscale Coherent Vortices



Bosse et al. (2014)



Climatology of intermediate waters and data points

Diamonds, triangles = SCVs, Circles = candidates

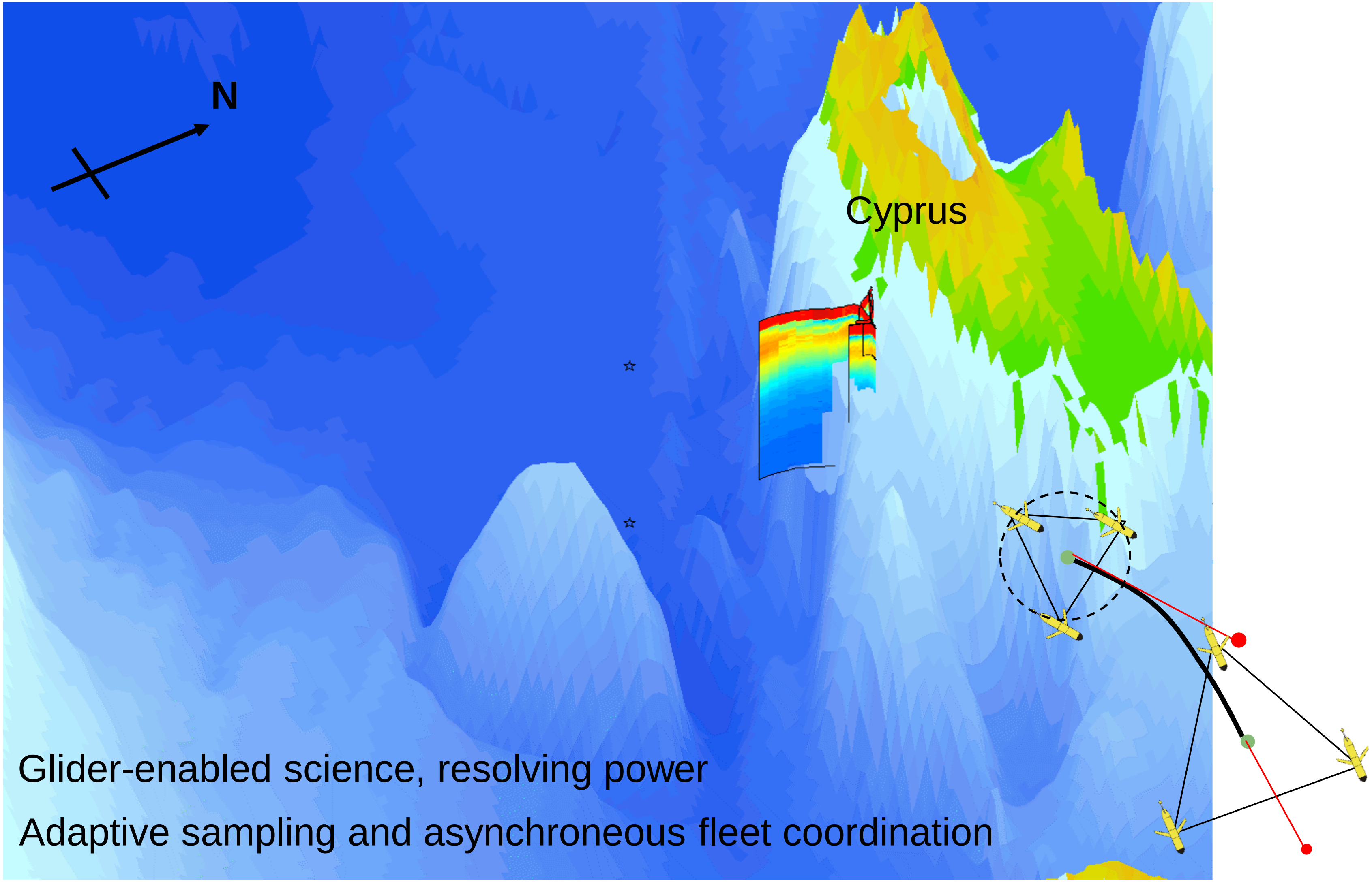
-Numerous SCVs in glider data (good resolution, link space-time-intensity)

-Revisited historical data. Isolated profiles (ships, floats) have been carried out in SCVs…

-formation process and impacts

→ Major impact on intermediate and deep circulations!

The preponderant role of Submesoscale Coherent Vortices



3D view, salinity along the gliders (scouts) trajectories
« Picture » of the Warm Core Cyprus Eddy and its dynamics
Context for biological measurements (Tara-Océans - genomics)

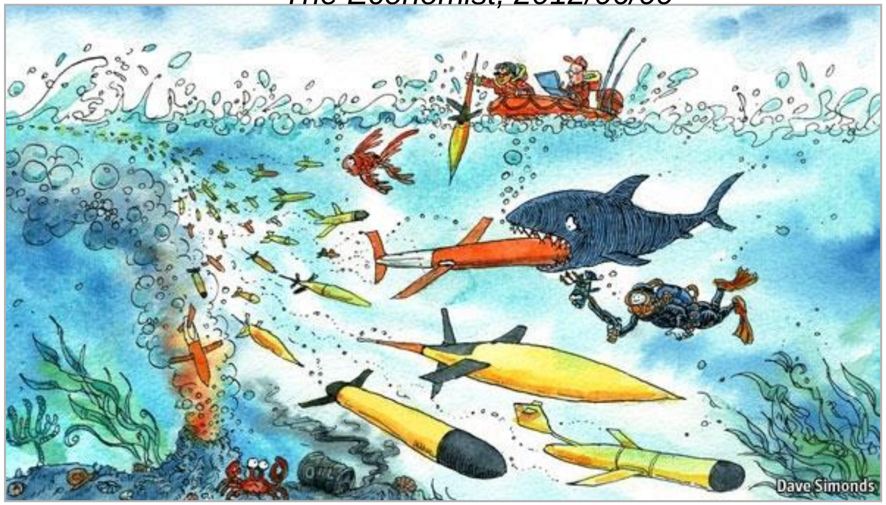
Conclusions

<u>Gliders can</u>

• be operated in strong conditions (weather, currents, ice) and maintained in regions of interest

• make high resolution physical and biogeochemical measurements over long periods of time/distances

The Economist, 2012/06/09



• make us enter a new era in oceanography (like “scalpels” or “Galileo’s telescopes”)

→ Gliders are great tools for long term observations and process studies of physical and biogeochemical variability/coupling at large, meso, and submesoscale, able to fill gaps left by the other observing components

→ The glider community is well organized but needs high-level support for

- carrying out sustained observations
- further developing observational capacities (>100 gliders on a process study!!)
- enabling more societal applications (directly from glider data and/or through ocean analyses/forecasts with data assimilation)

GLOBAL OCEAN OBSERVING SYSTEM www.ioc-goos.org