The glider simulator SIGLID

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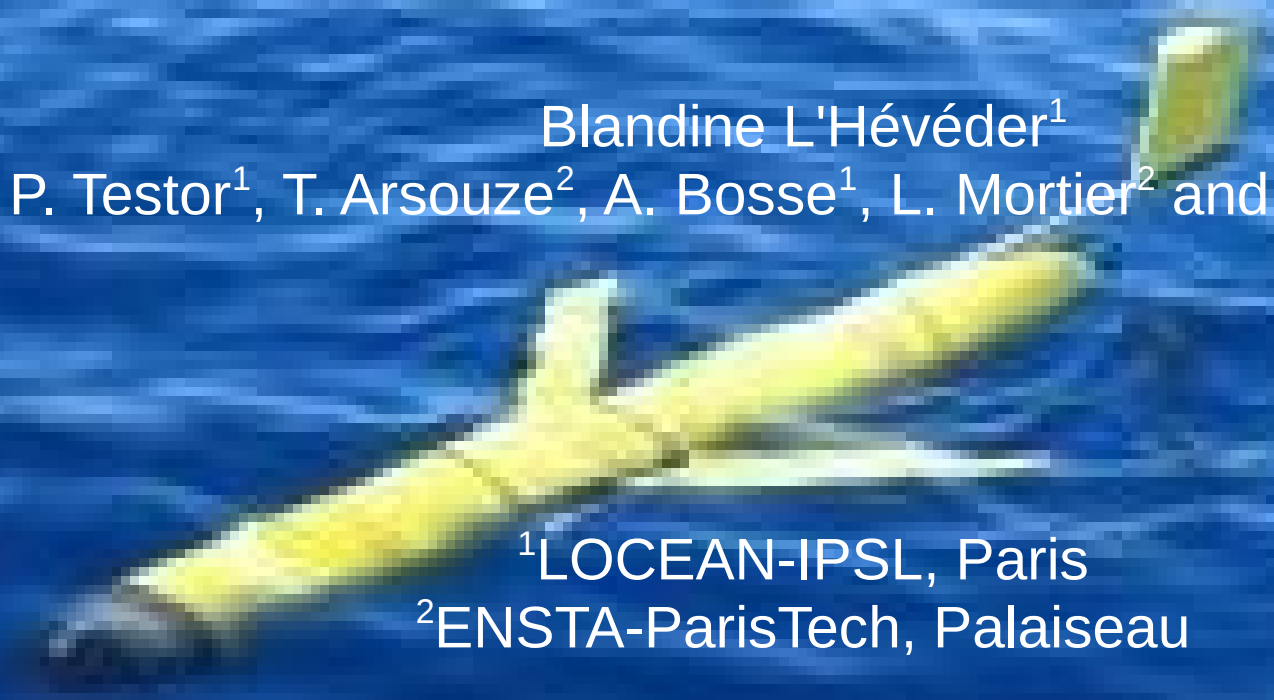
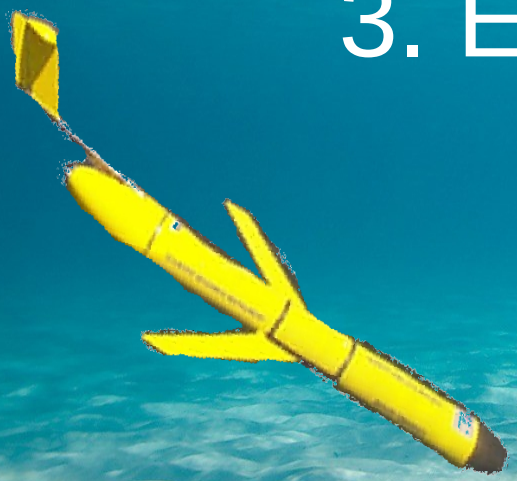
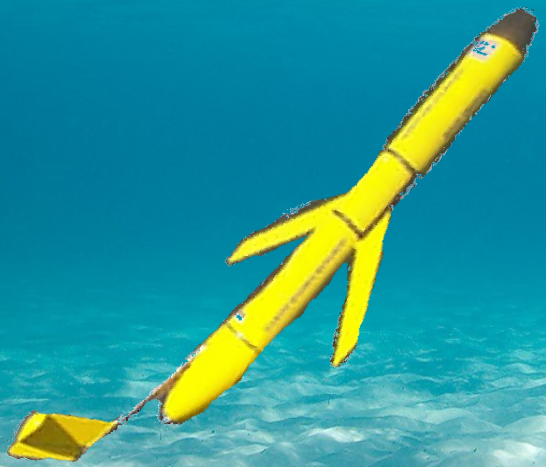


7th EGO Conference
Southampton, Sept 2016

1. What is SIGLID tool ?
2. Its various uses
3. Examples of use

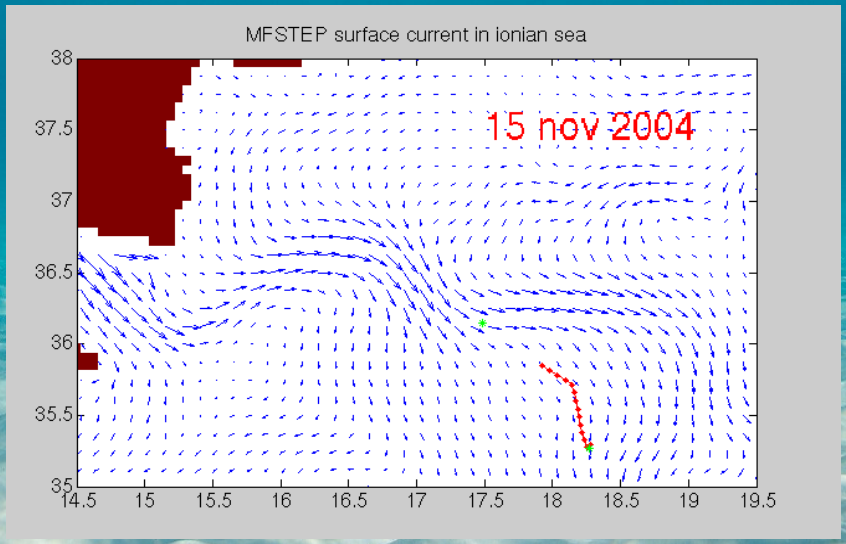


1. What is SIGLID tool ?



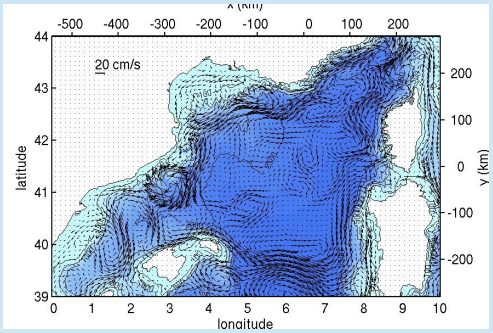
SIGLID tool

SIGLID is a computational tool (Fortran 95) dedicated to the **offline calculation of glider trajectories** in an **OGCM** output velocity field.



SIGLID tool

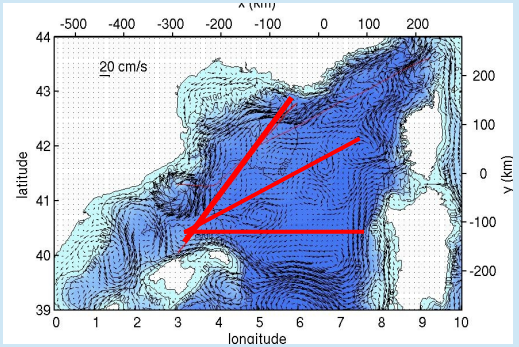
OGCM 3D fields
U V W T S



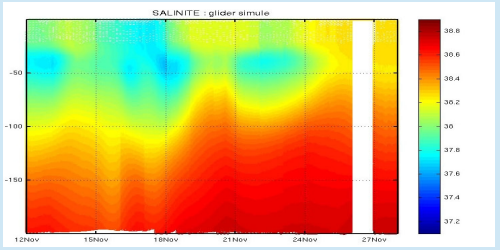
- Glider configuration
- Flight configuration
- Simulation characteristics

Glider simulator
SIGLID

GLIDERS



Trajectory (3D)



Sensor data (T,S,V)

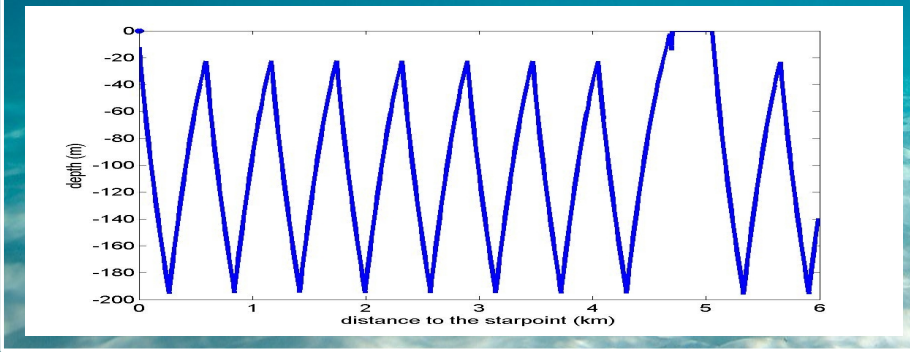
SIGLID tool

Glider configuration (slocum, spray…)

- Weight and volume of the glider
- Volume change due to the piston action
- Pitch angle of the glider
- etc

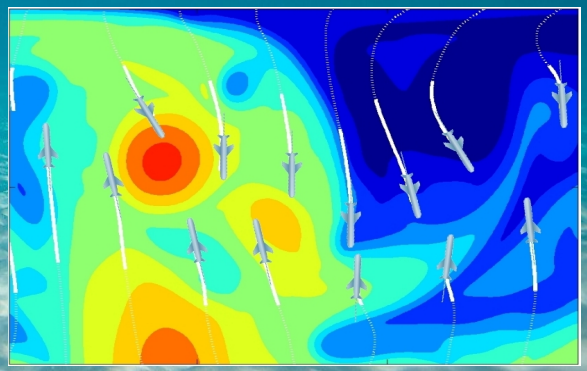
Flight configuration

- Sawtooth cycle : top and bottom depth of a yo, number of yos during a dive, time surfacing between two dives…
- Cap correction (optional)
- etc



Simulation characteristics

- Number of gliders
- Startpoint of each glider (lon, lat)
- List of the waypoints aimed for each glider (lon, lat)



SIGLID tool

easy to use
for non-modelers

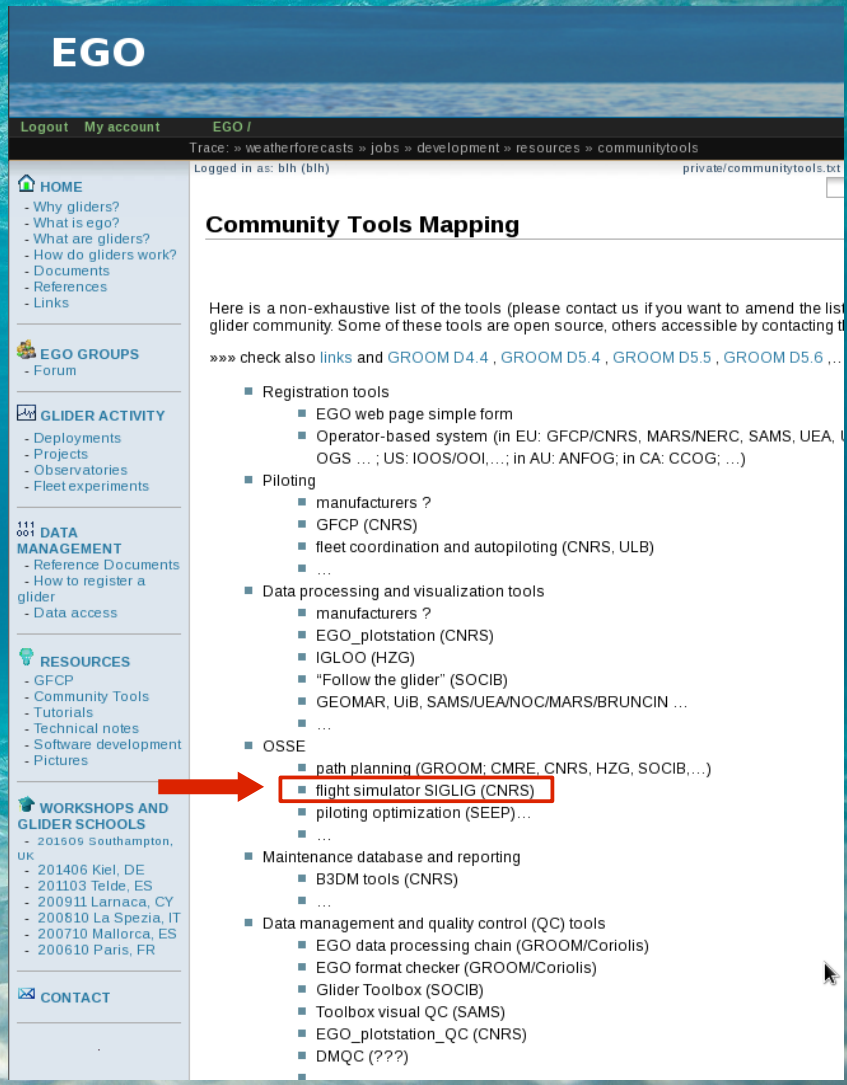
- **freely** put at the whole scientific community's disposal
=> available for downloading on EGO web site

- **easy to use**, **high portability**
=> supplied in a package with tools to install the program on your PC

- **adapted for different OGCM**
=> NEMO, ROMS, Symphonie

- simulated glider data are in the **EGO-glider netcdf format**

- **high performance**
=> takes 10mn for a 1 month simulation



2. Its various uses

- **Design of glider network deployment** for scientific or/and operational purposes

- **OSSE** to assess the capacity of a glider network to sample oceanic processes

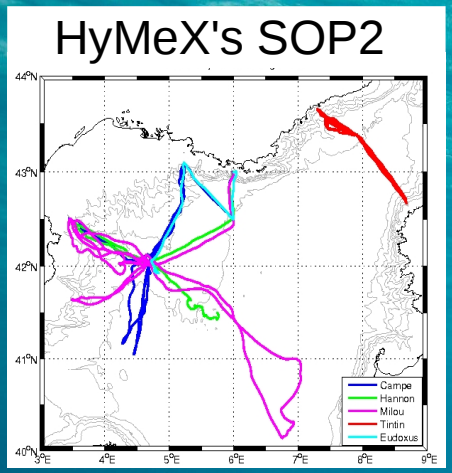
- **Glider steering tool** : operational forecast of glider trajectories during missions

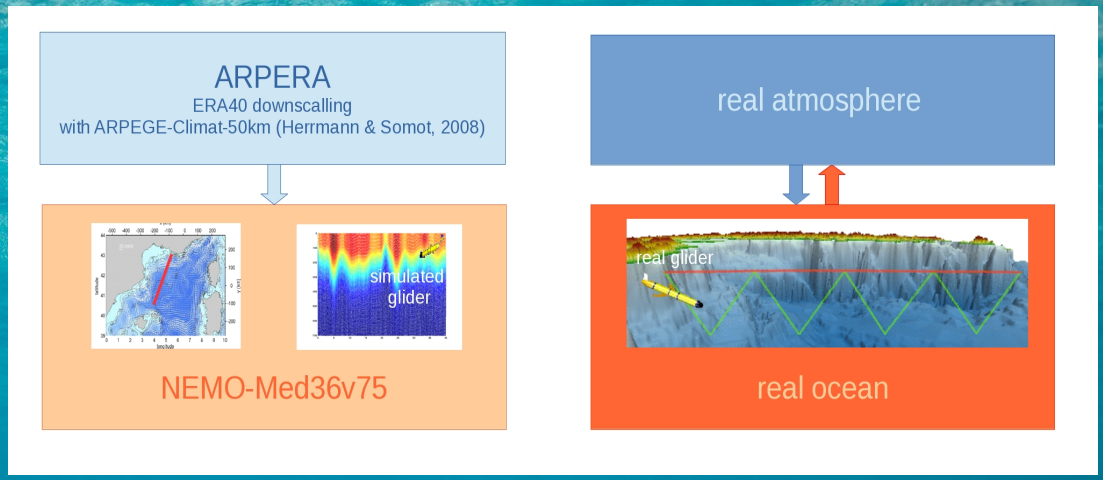
3. Examples of use

- Reliability of the **simulation of a glider network deployment**

- OSSE
  - Synoptic character of a glider sampling on a section
  - Synoptic view of the oceanic mesoscale variability

Reliability of the simulation of a glider network deployment



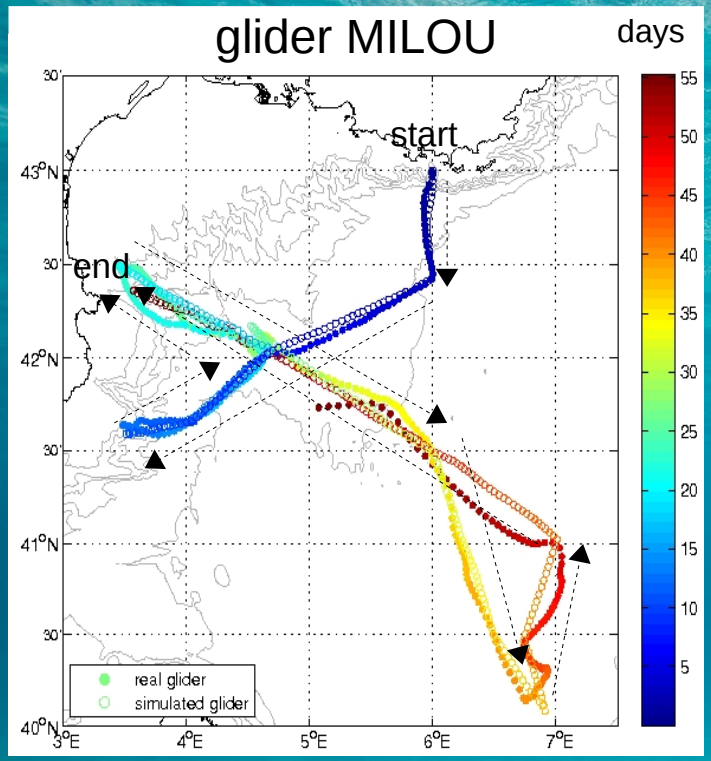


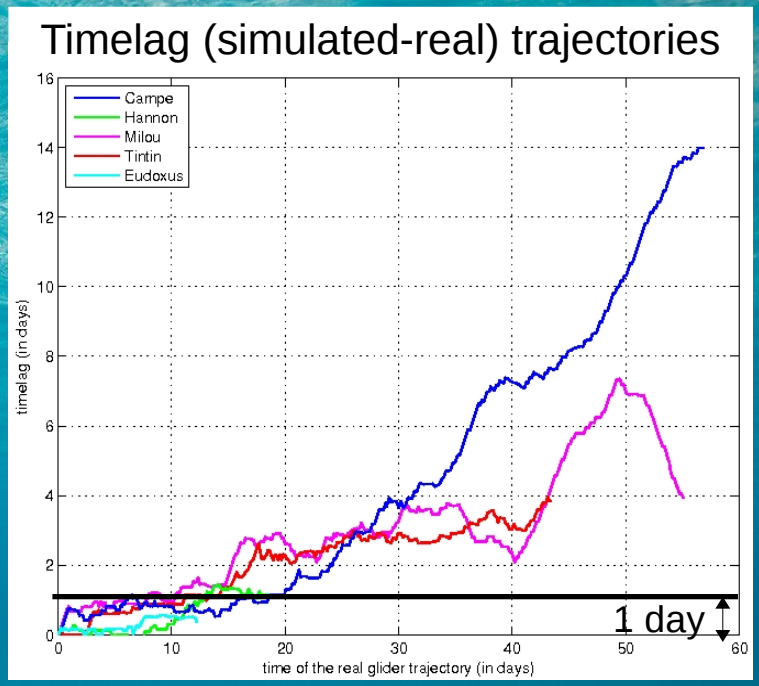
Same chronology of the atmospheric events.
Differences between real and simulated ocean hydrology/current

- **The glider samples its oceanic environment** (temperature, salinity, biogeochemical tracers,etc)
- **Its position depends on its oceanic environment** (via the ocean currents and local density)

Reliability of a simulated glider network deployment ?
in space ?
in time ?

Reliability of the simulation of a glider network deployment





Timelag between simulated and real gliders to reach every « yo » geographical position of the real glider. A positive timelag means that **the simulated glider is ahead of the real glider**.

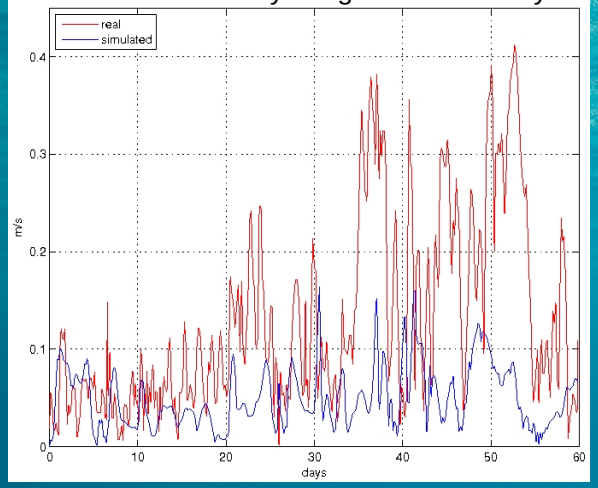
=> Simulated trajectories **very close in geographical position and time** during the **first 10 days** of the mission (difference of less than 20 km and 1 day).

=> After, the trajectories shift in time. **The simulated glider flies faster than the real glider** (it takes 4 to 14 days ahead after 55 days of mission).

Reliability of the simulation of a glider network deployment

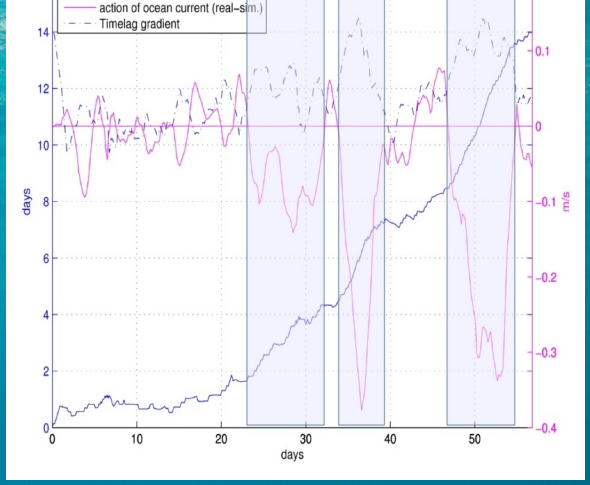
Glider CAMPE

ocean current velocity integrated over a « yo »



Modeled ocean currents are **lower by 40 %** than the **real ocean currents**.

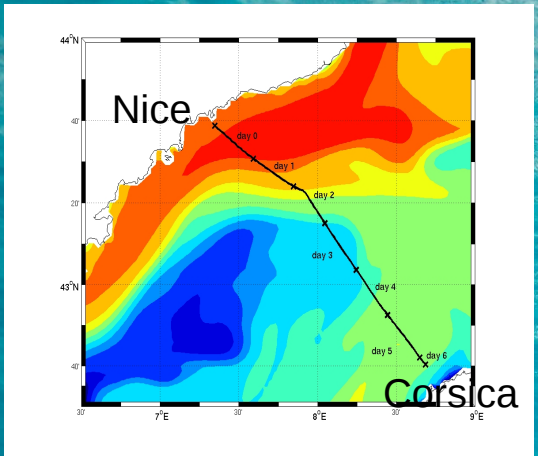
Analysis of Timelag



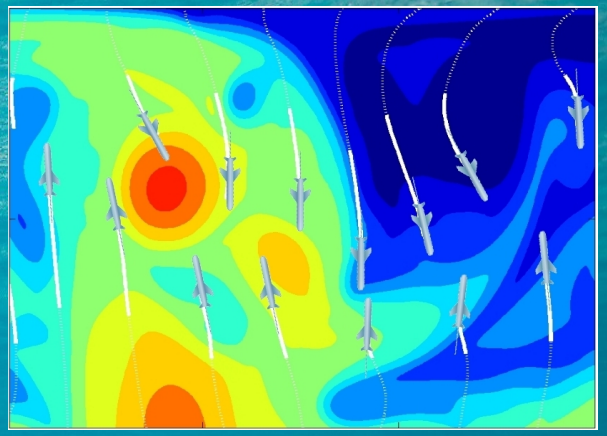
Episodes of **high timelag increase** between simulated and real gliders are linked to the **underestimation of the strong ocean currents** (slowing or blocking the glider) **in the modeled ocean**.

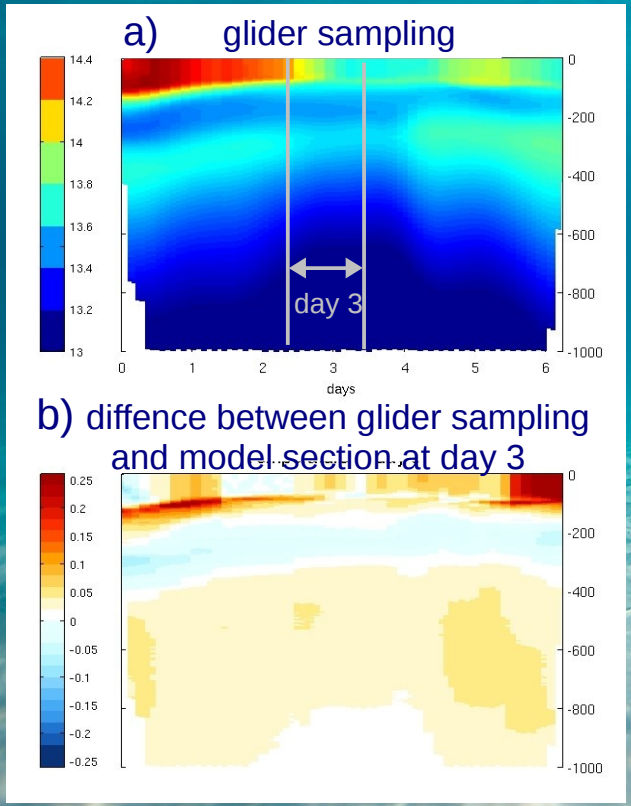
=> timelag due to the underestimation of ocean current intensity
=> simulation per slices of 10 days to keep a good reliability

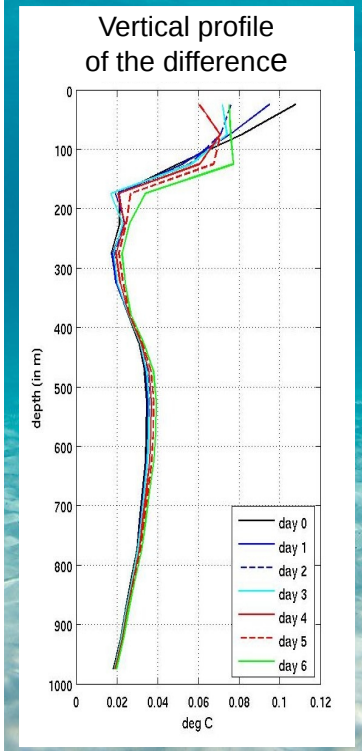
Synoptic character of a glider sampling

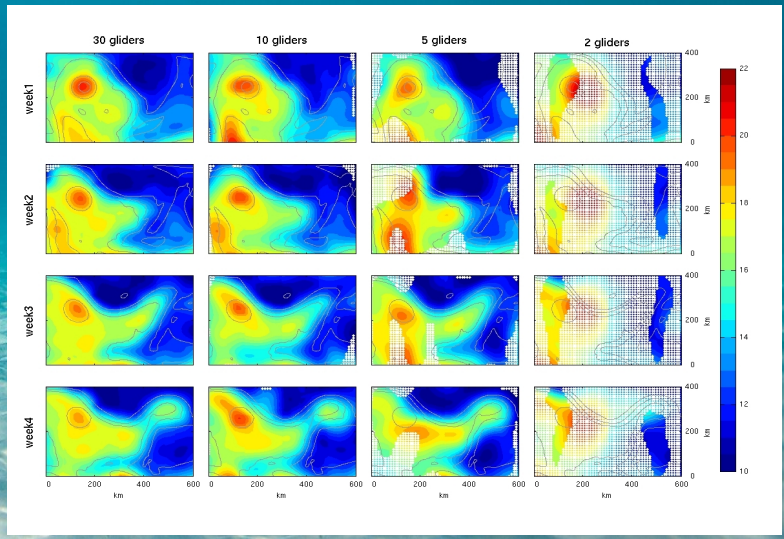


Comparison between
glider sampling
in the ocean model
and
3D ocean model









L'Hévéder et al., 2013

Conclusion and Perspectives

- For the design of glider network deployment for scientific or/and operational purposes
  => **simulation per slices of 10 days to keep a good reliability**

- The synoptic character of other sections of **Northwestern Mediterranean** will be analysed (eddy region, with more variability, etc).
  => results will help to **select the more interesting sections to sample regularly**.

- From 2017 => Implementation of a **glider trajectories operational forecast** for gliders in mission (EGO web site, GMMC project in collaboration with Mercator-Ocean)