

The glider simulator SIGLID

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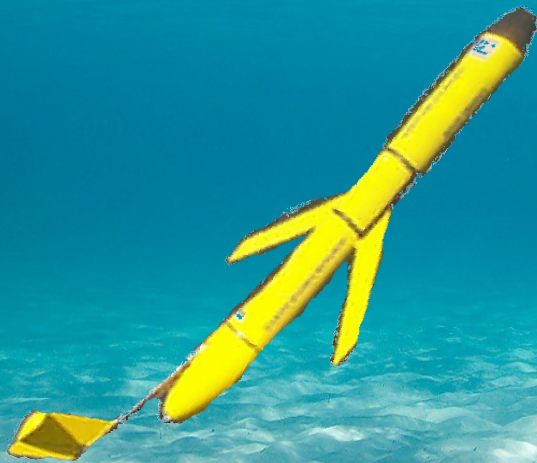
²ENSTA-ParisTech, Palaiseau

7th EGO Conference
Southampton, Sept 2016

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

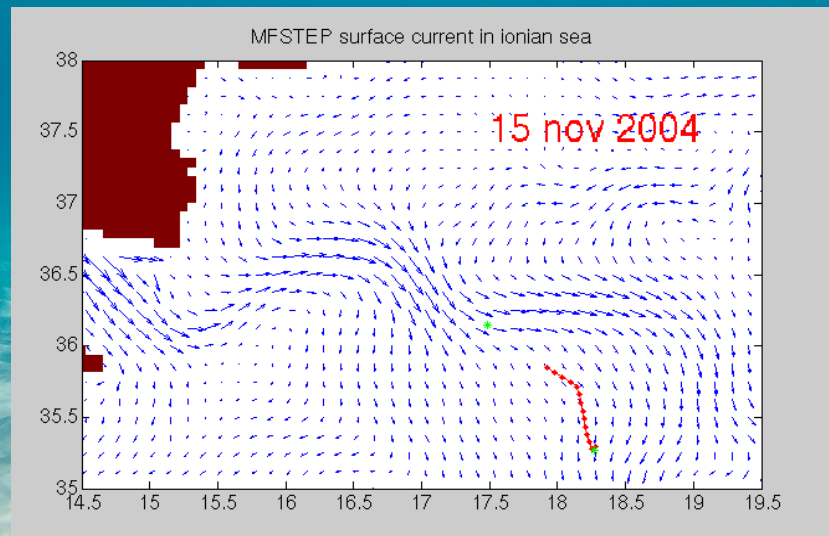


1. What is SIGLID tool ?



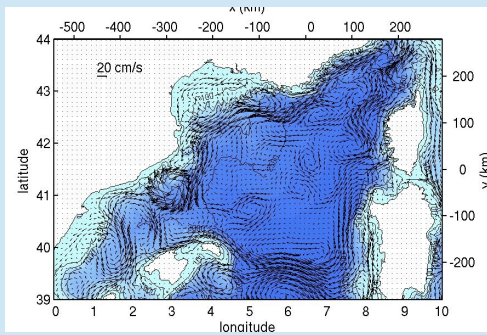
SIGLID tool

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



SIGLID tool

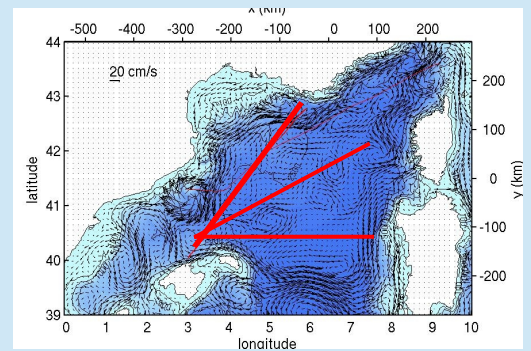
**OGCM 3D fields
U V W T S**



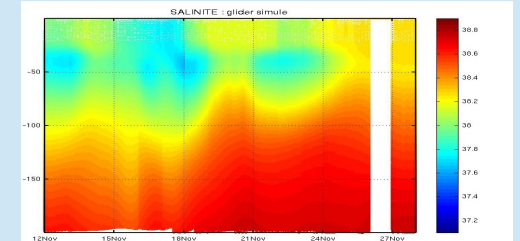
- Glider configuration
- Flight configuration
- Simulation characteristics

**Glider simulator
SIGLID**

GLIDERS



Trajectory (3D)



Sensor data (T,S,V)

SIGLID tool

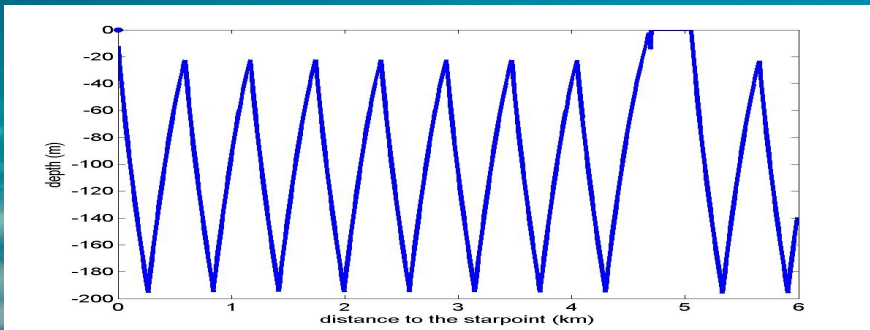
Glider configuration (slocum, spray...)

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



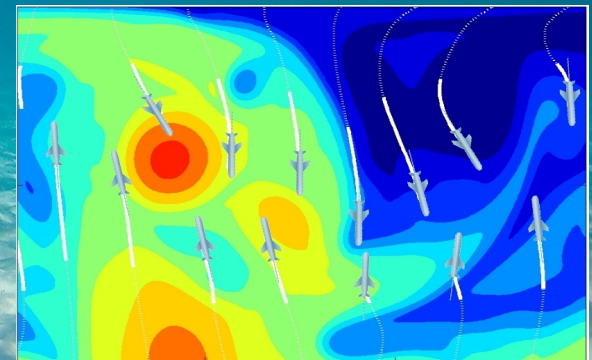
Flight configuration

- 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)



easy to use
for non-modelers

SIGLID tool

- **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

The screenshot shows the EGO website interface. The top navigation bar includes 'Logout', 'My account', and 'EGO /'. Below this is a breadcrumb trail: 'Trace: » weatherforecasts » jobs » development » resources » communitytools'. The main content area is titled 'Community Tools Mapping' and contains a list of tools categorized into Registration tools, Piloting, Data processing and visualization tools, OSSE, Maintenance database and reporting, and Data management and quality control (QC) tools. A red arrow points to the 'flight simulator SIGLID (CNRS)' link under the OSSE category.

EGO

Logout My account EGO /

Trace: » weatherforecasts » jobs » development » resources » communitytools

Logged in as: blh (blh) private/communitytools.txt

Community Tools Mapping

Here is a non-exhaustive list of the tools (please contact us if you want to amend the list glider community. Some of these tools are open source, others accessible by contacting the ...)

»»» check also [links](#) and [GROOM D4.4](#), [GROOM D5.4](#), [GROOM D5.5](#), [GROOM D5.6](#) ...

- Registration tools
 - EGO web page simple form
 - Operator-based system (in EU: GFCEP/CNRS, MARS/NERC, SAMS, UEA, ...; in US: IOOS/OOI, ...; in AU: ANFOG; in CA: CCOG; ...)
- Piloting
 - manufacturers ?
 - GFCEP (CNRS)
 - fleet coordination and autopiloting (CNRS, ULB)
 - ...
- Data processing and visualization tools
 - manufacturers ?
 - EGO_plotstation (CNRS)
 - IGLOO (HZG)
 - "Follow the glider" (SOCIB)
 - GEOMAR, UIB, SAMS/UEA/NOC/MARS/BRUNCIN ...
 - ...
- OSSE
 - path planning (GROOM: CMRE, CNRS, HZG, SOCIB, ...)
 - **flight simulator SIGLID (CNRS)**
 - piloting optimization (SEEP)...
 - ...
- Maintenance database and reporting
 - B3DM tools (CNRS)
 - ...
- Data management and quality control (QC) tools
 - EGO data processing chain (GROOM/Coriolis)
 - EGO format checker (GROOM/Coriolis)
 - Glider Toolbox (SOCIB)
 - Toolbox visual QC (SAMS)
 - EGO_plotstation_QC (CNRS)
 - DMQC (???)

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

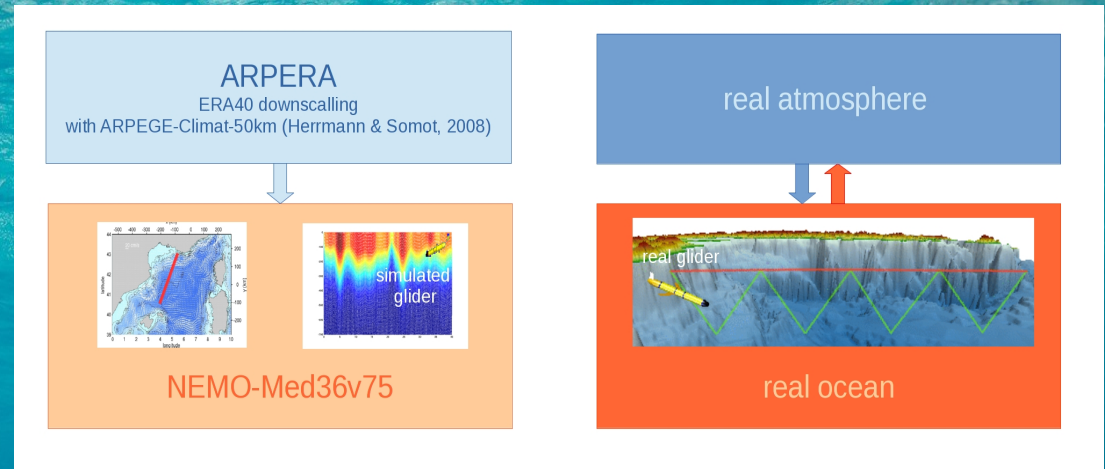
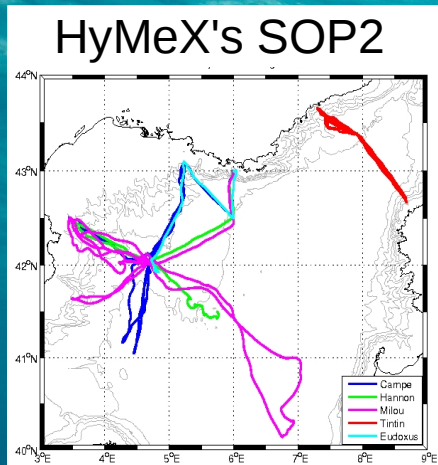


3. Examples of use

- 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

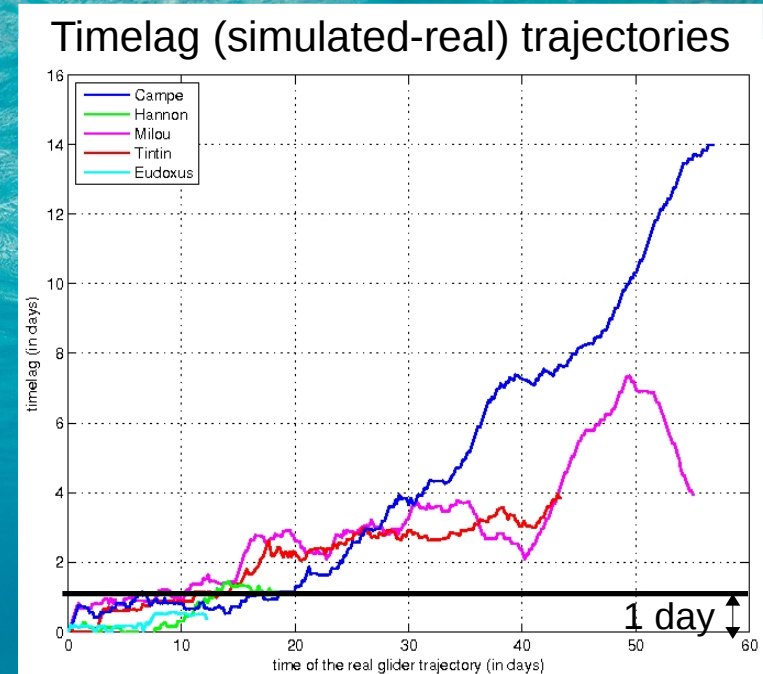
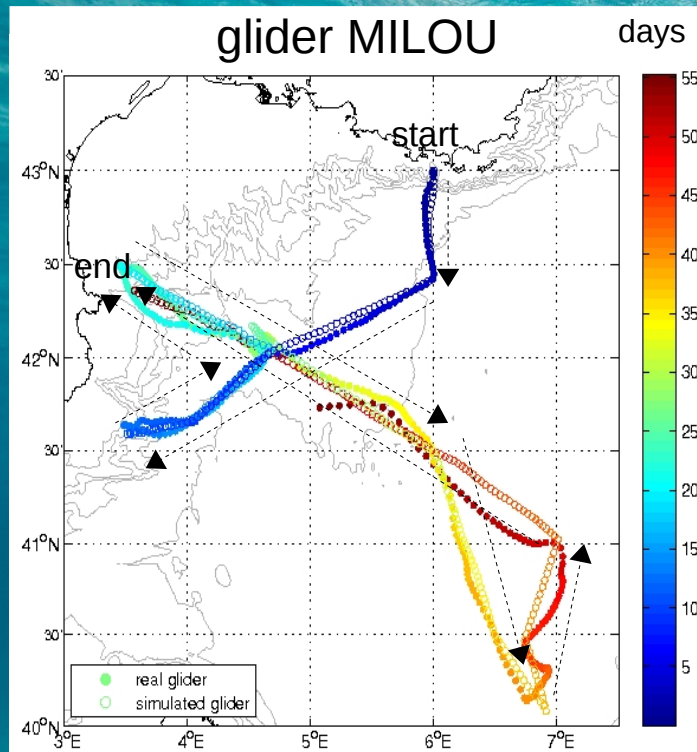


Same chronology of the atmospheric events.
Differences between real and simulated ocean hydrology/current

- ♦ **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

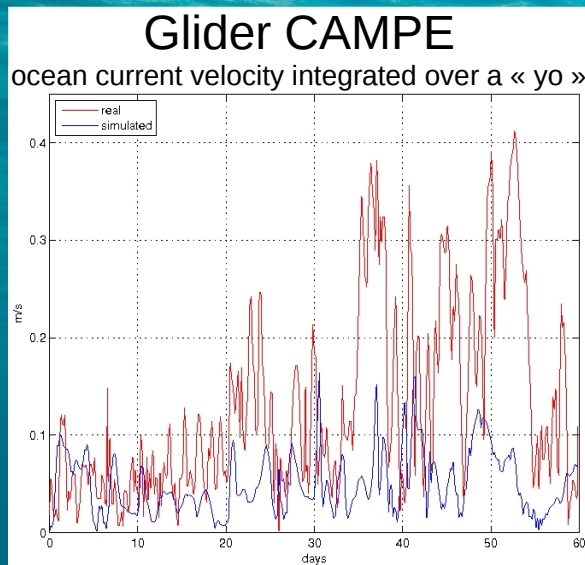


Timelag between simulated and real gliders to reach every « yo » geographical position of the real glider. A positive timelag means that **the simulated glider is ahead of the real glider**.

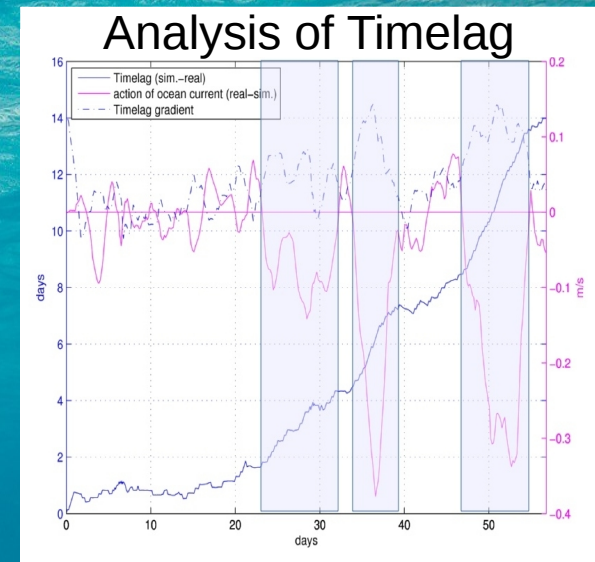
=> Simulated trajectories **very close in geographical position and time** during the **first 10 days** of the mission (difference of less than 20 km and 1 day).

=> 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



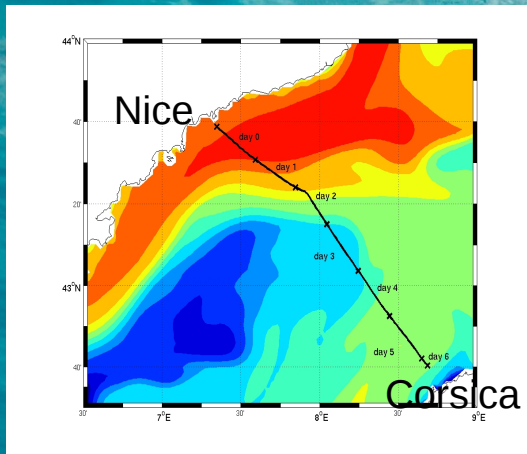
Modeled ocean currents are lower by 40 % than the real ocean currents.



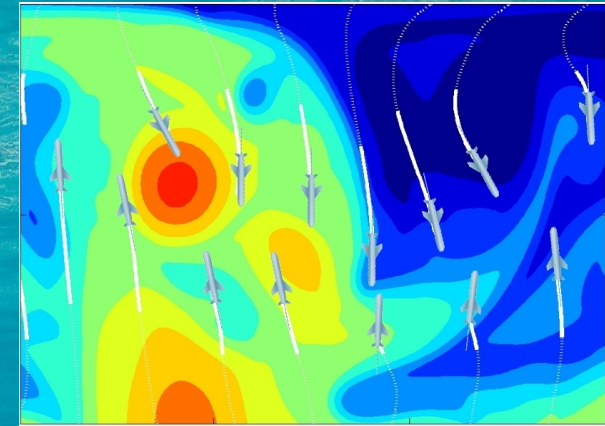
Episodes of **high timelag increase** between simulated and real gliders are linked to the **underestimation of the strong ocean currents** (slowing or blocking the glider) **in the modeled ocean**.

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

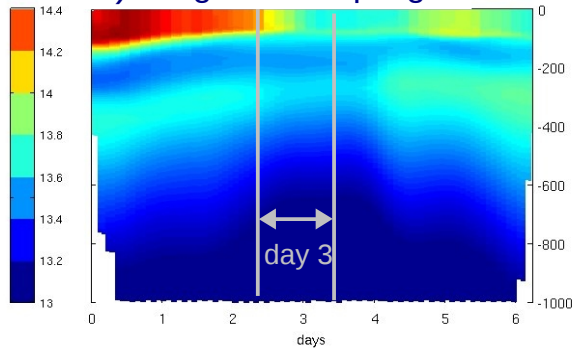
Synoptic character of a glider sampling



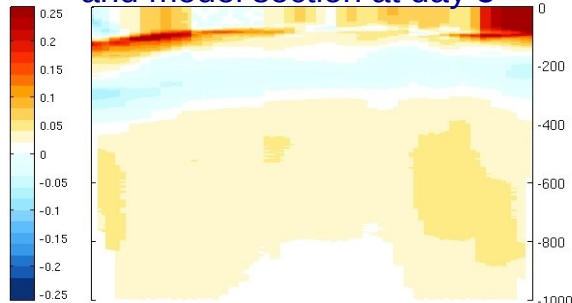
Comparison between
glider sampling
in the ocean model
and
3D ocean model



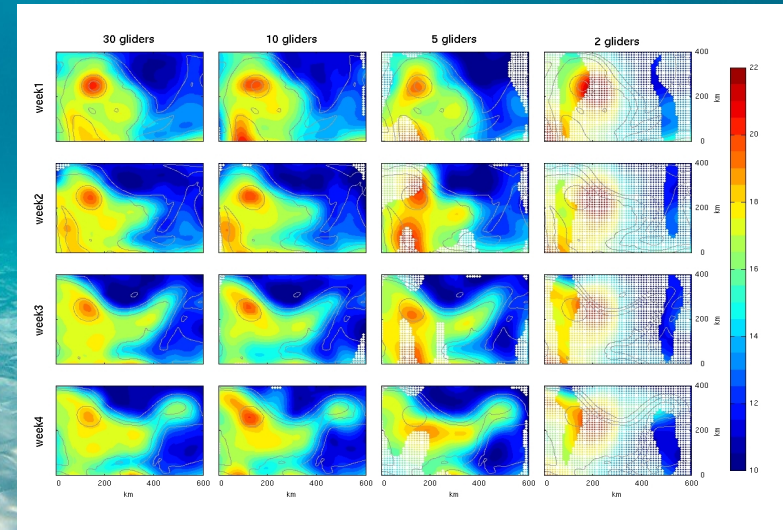
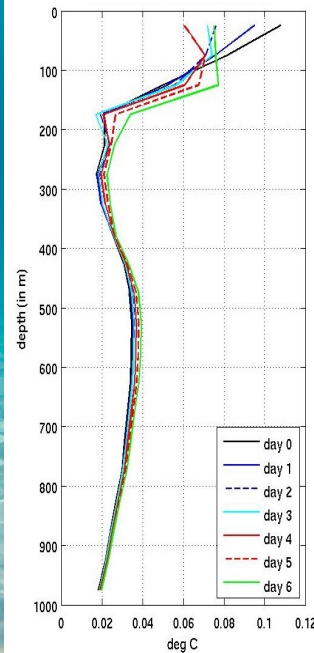
a) glider sampling



b) difference between glider sampling
and model section at day 3



Vertical profile
of the difference



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)



