LATEX_tools: a software package for navigation in a Lagrangian reference frame

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LATEX (LAgrangian Transport Experiment)
coupled physical and biochemical dynamics at the (sub) mesoscale in the coastal ocean
Gulf of Lion - NW Mediterranean

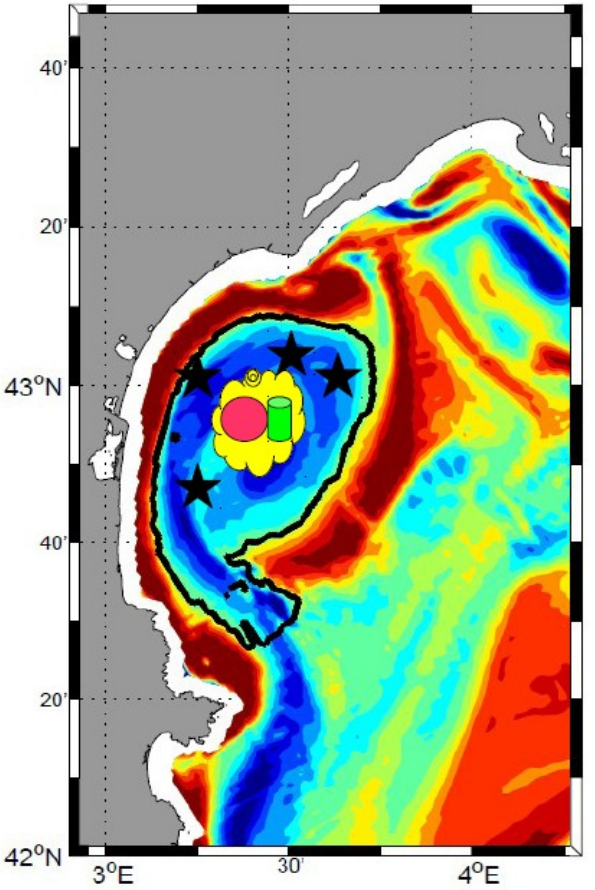
$$\frac{d}{dt}\int_{\mathcal{V}} \psi \, dV + \oint_{\mathcal{S}} \psi \mathbf{u} \cdot d\mathbf{S} + \oint_{\mathcal{S}} \boldsymbol{\chi} \cdot d\mathbf{S} = \int_{\mathcal{V}} \xi \, dV$$

Temporal variation	Advection (to be neglected)	Boundary exchanges horiz+vert	Sources & sinks (null for SF_6)

$$\psi = O_2, C, SF_6$$

Latex10 cruise goal:
to mark a mesoscale feature by releasing a passive tracer (SF6) together with an array of drifters.

Initial patch as homogeneous as possible:
need of adjusting continuously the vessel route in a Lagrangian reference frame moving with the structure.



Iridium buoy
- *real time communication*
- *anchored at 12 m*

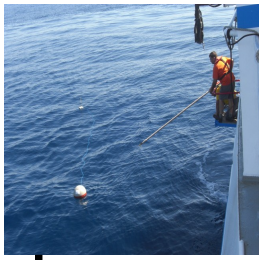
Carioca buoy
- *pCO_2 measurements*

15 Standard SVP drifters anchored at 15 m
- *Lagrangian drift*
- *patch deformation*

SF6 passive tracer
- injected at 10 m depth
- *deformation and mixing*

We developed the “Lagrangian navigation” software presented here

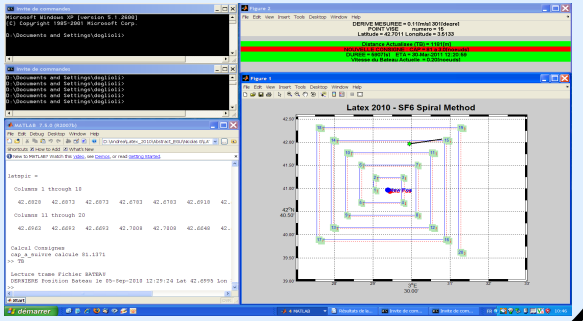
The algorithm



Vessel and buoy positions acquisition

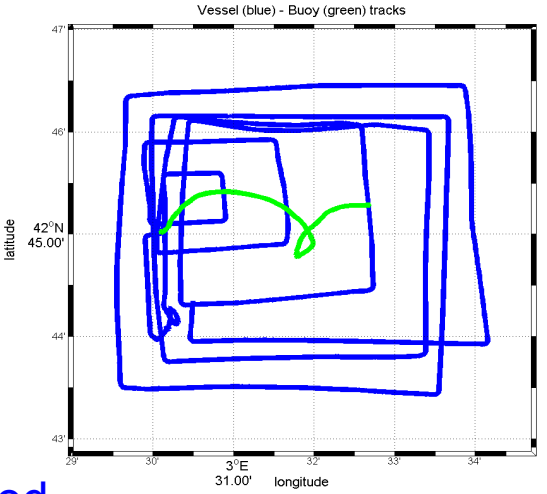
$$x_{vessel} + u_{vessel}\,t = x_{target} + u_{target}\,t$$
$$y_{vessel} + v_{vessel}\,t = y_{target} + v_{target}\,t$$
$$u_{vessel}^2 + v_{vessel}^2 = \left|\vec{v}_{vessel}\right|^2$$

Instructions for the bridge (direction and speed) and graphical interface

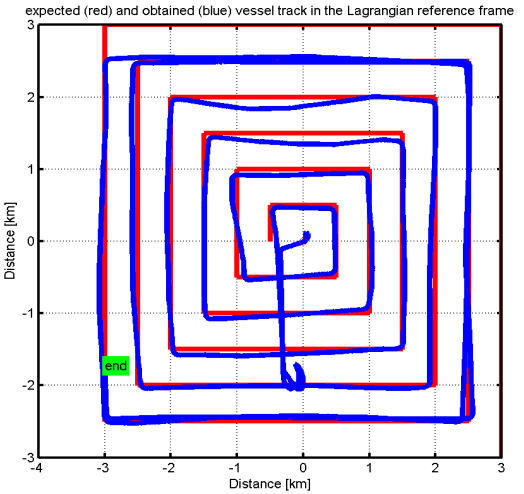


Example

Vessel and buoy tracks in geographical coordinates



Expected and obtained vessel track in the Lagrangian reference frame



The software is equipped with a series of graphical and user-friendly accessories and the entire package can be freely downloaded from the LATEX web site:

http://www.com.univ-mrs.fr/LOPB/LATEX