**Program LEFE/ action(s)**  
GMMC

**Project Title**  
Control and Assessment of the Mediterranean Northern Current Dynamics by means of data assimilation and dedicated parametrization at the interfaces

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**Participating Laboratories** : GHER (Liège)

**Contribution to**  
Nom des programmes internationaux

**Other funding sources** :

**Objectives (2-3 lignes)** :  
The main goal is to enhance the Mediterranean Northern Current dynamics simulation in a NEMO High resolution ocean configuration (GLAZUR64), by means of data assimilation and parametrization both developed at the ocean domain interfaces, either the sea surface or the open ocean boundaries.

**main results:**

1. **HF radar current data assimilation**
   
   An optimization strategy of the wind at the sea surface, and of the temperature, salinity plus the horizontal currents at the open boundaries of the ocean domain has been developed and applied. Wind optimization has been performed by twin experiments and radar HF current data have also been used to correct the model simulations at the ocean domain OBC.

   Wind optimization appears to be more efficient than the OBC optimization but the latter seems to be perfectible. This first attempt to control the Northern Current dynamics by an OBC constraint appears to be very promising. This work opens possibilities in coastal data assimilation frameworks.

2. **Analysis and optimization of the high resolution model**

   First, configurations using free-slip and no-slip conditions at the lateral boundaries are compared. The no-slip condition favors instabilities, meanders and eddies. In addition, the northern current appears to be less close to the coast, which is a good improvement. Unfortunately, the instabilities introduced can be too strong compared to the observed data. A future constraint needs to be studied, maybe with a partial slip condition. Second, the influence of the vertical resolution has been studied. The idea is that by increasing the resolution for the top layers, the Northern Current simulation might be improved as it is confined in the first 600 m. Unfortunately, the results are not clear as the new solution tends to produce results in poorer agreement with the observations compared to the former configuration.

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**Fig. 1:** Difference vector between the original and the corrected field from the wind optimization (a) and OBC (b)

**Fig. 2:** Averaged GLAZUR64 velocity fields over 150m for 4 different parameterizations. Top to bottom, left to right: free-slip, no-slip, OBC with orthogonal velocity component only, increased vertical resolution.
Future of the project:
The work performed on the control of the OBC by data assimilation is very promising but needs future improvement and development, especially considering the fact that its field of application is linked to the development of high resolution model for coastal monitoring. The methodology needs to be improved to allow an easier way of building the forcing set to control the OBC.
The work performed on the dedicated parametrization has shown that high resolution models are very sensitive to different parametrization that needs to be cautiously prepared when high resolution processes are studied. Future work will also involve work on the vertical dynamics.

<table>
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<tr>
<th>Nombre de publications, de communications et de thèses</th>
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<td>(citer au maximum 5 publications en lien direct avec le projet)</td>
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Guihou K., 2013. Etude de la dynamique du Courant Nord au large de Toulon, à l’aide de modèle, observations in-situ et données satellites. Thèse USTV