

AMPHITRITE

X-Novation Center,
École Polytechnique,
Paris Area, France



CVs: alexandre.stegner@amphitrite.fr

MASTER INTERNSHIP

3D Eddy Scan: real time eddy detection & characterization

Oceanic mesoscale eddies are ubiquitous in the ocean. They are typically 10-300 km in diameter and may live for several months and propagate across ocean basins. They are usually understood as coherent structures able to transport heat, salt, nutrients, dissolved carbon, oxygen or biogeochemical material. In their interior, water is isolated from the surrounding ocean and can reach areas strongly different in terms of characteristics. These structures can be detected by in-situ observations (e.g. Argo floats) and from surface satellite observations (Sea Surface Temperature, chlorophyll imagery or AVISO/DUACS altimetry). However, a precise characterization of the dynamics below the surface is limited because satellite observations provide no information about depth and in-situ measurements inside eddies remain scarce. Therefore, the vertical extension and the 3D characterization (i.e. nowcast), in real time of mesoscale eddies are difficult. Moreover, recent studies (Barboni *et al.* 2023) have shown that the oceanic mixed-layer is also modulated by these moving structures.

The aim of this internship is to improve & develop an innovative tool (3D Eddy Scan) able to detect, characterize and track oceanic features in 3 dimensions combining high resolution satellite observations (SST and CHL), standard altimetry (AVISO/DUACS) and in-situ Argo profilers. Our first area of interest will be the Mediterranean Sea, where an important zoology of eddies has already been observed (Mkhinini, 2014;). This work is part of a wider project conducted by AMPHITRITE for the SHOM (Hydrographic and Oceanic Department of the Navy) with whom the intern will interact. A follow up of the **DYNED-Atlas data** base will be a first step for this project.

AMPHITRITE is an ocean tech start-up founded, two years ago, by oceanographers and AI researcher passionate by the ocean. We are today a growing team of ten experts focused on AI data-fusion providing the state of the art of ocean-data and innovative decision-support tools for various maritime stakeholders.

This project will suit a highly motivated master student willing to gain experience within an ocean tech start-up and deepens its knowledge on mesoscale dynamics. The intern is expected to have a coding knowledge of python or matlab, and at least two of the following expertise: Oceanographic dynamics, Remote sensing data, Argo profile analysis, Artificial Intelligence, Air-Sea interactions.

Internship allowance: 1200€/month.

Barboni, A., Coadou-Chaventon, S., Stegner, A., Le Vu, B., and Dumas, F.: How subsurface and double-core anticyclones intensify the winter mixed layer deepening in the Mediterranean sea, EGU sphere, <https://doi.org/10.5194/egusphere-2022-649>, 2022.

Mkhinini, N., A. L. S. Coimbra, A. Stegner, T. Arsouze, I. Taupier-Letage, and K. Béranger (2014), Long-lived mesoscale eddies in the eastern Mediterranean Sea: Analysis of 20 years of AVISO geostrophic velocities, *J. Geophys. Res. Oceans*, 119, 8603–8626, doi:10.1002/2014JC010176.

