

Master 2

INTERNSHIP PROPOSAL

Laboratory name: Laboratoire d'Océanologie et de Géosciences, UMR 8187

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Internship location: Laboratoire d'Océanologie et de Géosciences (LOG), Wimereux collaboration (and visits) Unité de Mécanique de Lille (UML), EA 7512, Lille

Thesis possibility after internship: YES

TURBULENT PHYTOPLANKTON DYNAMICS

Phytoplankton are unicellular algae (of several different types) that transform inorganic materials and light into living matter in aquatic ecosystems. Therefore, they are the main responsible for primary production in oceans and lakes and they are at the base of virtually any aquatic food web. Owing to their role in photosynthesis, meaning the capability of removing carbon dioxide from the atmosphere to release oxygen, such microorganisms have a deep impact on the climatic system and their distribution is an important variable in climate models. Due to the complex interplay of biological and physical processes, phytoplankton dynamics display considerable spatiotemporal variability at both large and small scales.

This internship is focused on phytoplankton dynamics in the turbulent upper ocean. Its goal is to collect data from observations to estimate relevant biophysical parameters for comparison with the results from a numerical model (and improvement of the latter), particularly along the vertical, in light-limited (eutrophic) conditions. While the direct comparison of experimental and numerical results may not be always immediate, this study should allow a better integration of experimental fluid mechanical and biological information, which is a necessary step to improve the understanding of phytoplankton dynamics.

We plan to conduct field measurements to obtain simultaneous vertical profiles of turbulent kinetic energy dissipation rates and fluorescence, a proxy for phytoplankton biomass. The selected study area is the eastern English Channel (Fig. 1), a shallow epicontinental megatidal sea characterized by strong currents and intense mixing. LOG laboratory is located in Wimereux, few kilometers from Boulogne-sur-Mer, along the French coast of the Channel. This is an almost eutrophic marine ecosystem, where significant spring blooms are observed. The measurements will be conducted during the bloom occurrence, in May and June, from LOG's research vessel, by means of an acoustic Doppler velocimeter (to sample the flow) and a high-resolution fluorometer (to sample the phytoplankton biomass).

The expected outcome of this activity is to obtain information about the spatiotemporal variability of the vertical profiles of both turbulence intensity and phytoplankton biomass. The data will be exploited to explore the correlations between turbulent flow dynamics and bloom events, as well as for the calibration of the previously mentioned numerical model.

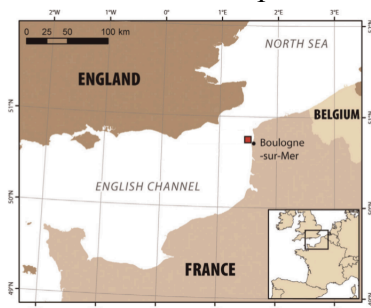


Figure 1: The selected study area; adapted from J. Derot et al., *Cont. Shelf Res.* **109**, 210 (2015).

Specialities: macroscopic physics and complexity, experimental approaches