

## Proposal for a M2 internship (spring 2027) and a PhD thesis starting in October 2027

### Mimicking the ocean in the lab: the ultimate experiment

Fluid stratification in density together with the Earth rotation are central ingredients of the dynamics of the oceans and atmosphere. They deeply modify turbulence by allowing internal waves to propagate in the bulk of the fluid. Turbulent dynamics at atmospheric and oceanic “small scales” is known to be dominated by these internal waves. In global climate simulations, these small scales are however generally not resolved because of prohibitive computation times and their action is accounted for by parameterizations. Improvement of these parameterizations based on physical theories is an important current challenge. In this framework, the so-called Wave Turbulence Theory is a major avenue which however faces analytical difficulties. The predictions remain uncertain and have not been validated yet in laboratory experiments where a genuine internal wave turbulence regime has not yet been reached.

The M2 internship and the following PhD thesis will consist in assembling (during the internship) and running (during the thesis) a new experimental setup aiming at reaching this wave turbulence regime in a stratified and rotating fluid to test the theoretical predictions. The setup will consist in a rotating hexagonal water tank, 4 m high and 4 m large, filled with 40 000 L of salt stratified water installed on the 13 m diameter rotating Coriolis platform in LEGI laboratory in Grenoble. Beyond the purely experimental work, a statistical analysis of the data will be conducted and interpreted in the framework of the Wave Turbulence Theory. Existing data from a smaller experiment will be analyzed at the beginning of the internship to get familiar with the processing.

Four two-month experimental campaigns will take place in Grenoble over the course of the internship and the PhD (three and a half years). The PhD student's “base camp”, where the analysis of the data collected during the campaigns will be carried out, will be the FAST laboratory in Orsay. However, the possibility of also conducting this part of the project in Grenoble can be discussed.

Candidates should have received a high-level academic training in non-linear physics and/or in fluid dynamics.

Contacts : **Pierre-Philippe Cortet** (DR CNRS, laboratoire FAST, Orsay)

[pierre-philippe.cortet@universite-paris-saclay.fr](mailto:pierre-philippe.cortet@universite-paris-saclay.fr)

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**Nicolas Mordant** (Professeur UGA, LEGI, Grenoble)

[nicolas.mordant@univ-grenoble-alpes.fr](mailto:nicolas.mordant@univ-grenoble-alpes.fr)

<http://nicolas.mordant.free.fr/>