MERCATOR OCEAN INTERNATIONAL

Internship Master Project M/W

5-6 months (starting early 2024)

How to apply :

Send your cover letter and detailed resume with the following reference 2023-11/OO/InternshipAWO to recruitment@mercator-ocean.fr

Deadline for applications: 01/12/2023

Date of publication : 08/11/2023

Project title for a Master 2 student internship: Atmosphere-wave-ocean coupling in idealized model configurations

About the project:

Mercator-Ocean produces daily ocean forecasts using the Nemo numerical model. As part of this M2 internship, we want to explore whether the representation of the interactions between the ocean, waves and the atmosphere can allow us to improve these predictions.

To measure the effect of these different couplings on the ocean, we will set up an idealized configuration based on the Nemo ocean model, the MF-WAM wave model and the ABL1D atmospheric boundary layer model. This configuration will allow us to easily control the direction and intensity of the currents and winds, the associated wind sea, as well as the presence or absence of swells.

As a first step, ocean-wave coupling experiments will be carried out in order to verify in this idealized environment whether the effect of waves on the ocean is comparable to that measured in a global ocean configuration (Law Chune & Aouf, 2018), i.e. a decrease in energy transfer from the atmosphere to the ocean at tropical latitudes dominated by swells and an increase at mid-latitudes dominated by the westerlies-forced wind sea.

In a second step, idealized simulations coupling the ocean and the atmospheric boundary layer will be carried out to measure the reduction of kinetic energy transfer from the atmosphere to the ocean for different wind and current conditions, and to verify its realism compared to global realistic simulations (Lemarié et al. 2020).

Finally, we will perform idealized simulations including waves, the atmospheric boundary layer, and the ocean to determine whether wave-atmosphere interactions modify previously measured effects on the ocean independently of waves and atmosphere.

Skills to succeed:

The skills expected on this subject are a good understanding of the physical processes at the interface and the ocean-atmosphere boundary layers, as well as programming knowledge (Fortran, Python, Shell) to manipulate the different models, as well as to launch and analyse simulations on the Météo-France high performance computer.

Supervisors:

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Useful references:

Law Chune, S., & Aouf, L. (2018). Wave effects in global ocean modeling: parametrizations vs. forcing from a wave model. Ocean Dynamics, 68(12), 1739-1758.

Lemarié, F., Samson, G., Redelsperger, J. L., Giordani, H., Brivoal, T., & Madec, G. (2021). A simplified atmospheric boundary layer model for an improved representation of air–sea interactions in eddying oceanic models: implementation and first evaluation in NEMO (4.0). Geoscientific Model Development, 14(1), 543-572.

Who are we?

Mercator Ocean International has been developing operational oceanography activities for nearly 25 years, as part of its public interest mission to preserve the ocean.

Many scientific and societal challenges must be met to ensure a sustainable ocean, whether they concern the environment, biodiversity, climate change, the blue economy or education. To meet these challenges, Mercator Ocean designs, develops, operates and maintains state-of-the-art digital systems capable of describing, analysing and forecasting the state of the ocean in 3D, continuously and in real time. The scientific information is then translated to be accessible to all, whether they are public or commercial services, political decision makers, industrialists, associations, NGOs, teachers or citizens. Mercator Ocean International thus combines scientific excellence and social commitment on a daily basis.

As a non-profit company under multinational governance (ES, FR, GB, IT, NO), we work in a climate of trust with our ten shareholder partners, all key players in the development of European oceanography.