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 2023-10/OO/Validation-MHW2 to recruitment@mercator-ocean.fr

Deadline for applications: 01/12/2023

Date of publication : 25/10/2023

Project title: Projections of MHWs on the North-east Atlantic under climate change

Marine Heat Waves (MHWs) – episodic events during which ocean waters suffer anomalously high temperatures – are becoming more ubiquitous in the ocean, more intense, more widespread and lasting longer, with devastating consequences for ecosystems and marine services. Additionally, with sea temperatures committed to increase due to climate change, MHW intensity and occurrences are expected to increase substantially in the coming century. In order to develop efficient mitigation and adaptation measures against this increasing hazard, a quantification of the MHW intensification and frequency change, as well as MHW-prone emerging areas is needed. While literature on the climate change impacts on MHWs is increasing, available studies are typically based on coarse datasets or simplified approaches that potentially misrepresent the spatio-temporal nature of the MHWs and their evolution under climate change.

At Mercator Ocean International, past and near-future MHW are monitored and forecasted using 3D numerical models of the ocean. For this, Mercator has developed an algorithm to detect and classify the occurring MHWs from the modelled surface temperature fields. In addition to monitoring and forecasting, Mercator also produces long term ocean projections that run until 2100 for the North-east Atlantic region considering multiple climate change scenarios as defined by the IPCC. In comparison to available projections from global models (CMIP6), these simulations provide higher resolutions (1/12 degree) and added physical processes that are regionally relevant for ocean dynamics, and hence provide an opportunity to better quantify regional patterns of MHW trends under climate change.

For this master project we propose to investigate the evolution of the MHW landscape under climate change for the North-east Atlantic. In a first part, the project will focus on the application of the existing detection algorithm to the simulations on the historical climate, in order to evaluate potential biases relative to observation-driven datasets and to develop metrics that monitor the recurrence of MHWs. In a second part, the focus will be on comparing such monitoring metrics between future and historical simulations, and detecting robust signals of change:

- Month 1: bibliography and handling of tools (python language, MHW algorithm detection, model output format)
- Month 2-3: Historical MHW detection and characterization, comparing to observation-based datasets.
- Month 4-5: Comparison historical/future MHW occurrence and manuscript redaction

Supervisors:

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Useful references:

- MHW evolution under climate change: https://www.nature.com/articles/s41586-018-0383-9
- Methods for evaluation of change in recurrence of heat waves: https://iopscience.iop.org/article/10.1088/1748-9326/aab827/pdf
- Attribution of change in recurrence of MHWs to climate change: https://www.science.org/doi/10.1126/science.aba0690
- Defining Single Extreme Weather Events in a Climate Perspective: https://doi.org/10.1175/BAMS-D-17-0281.1.

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.