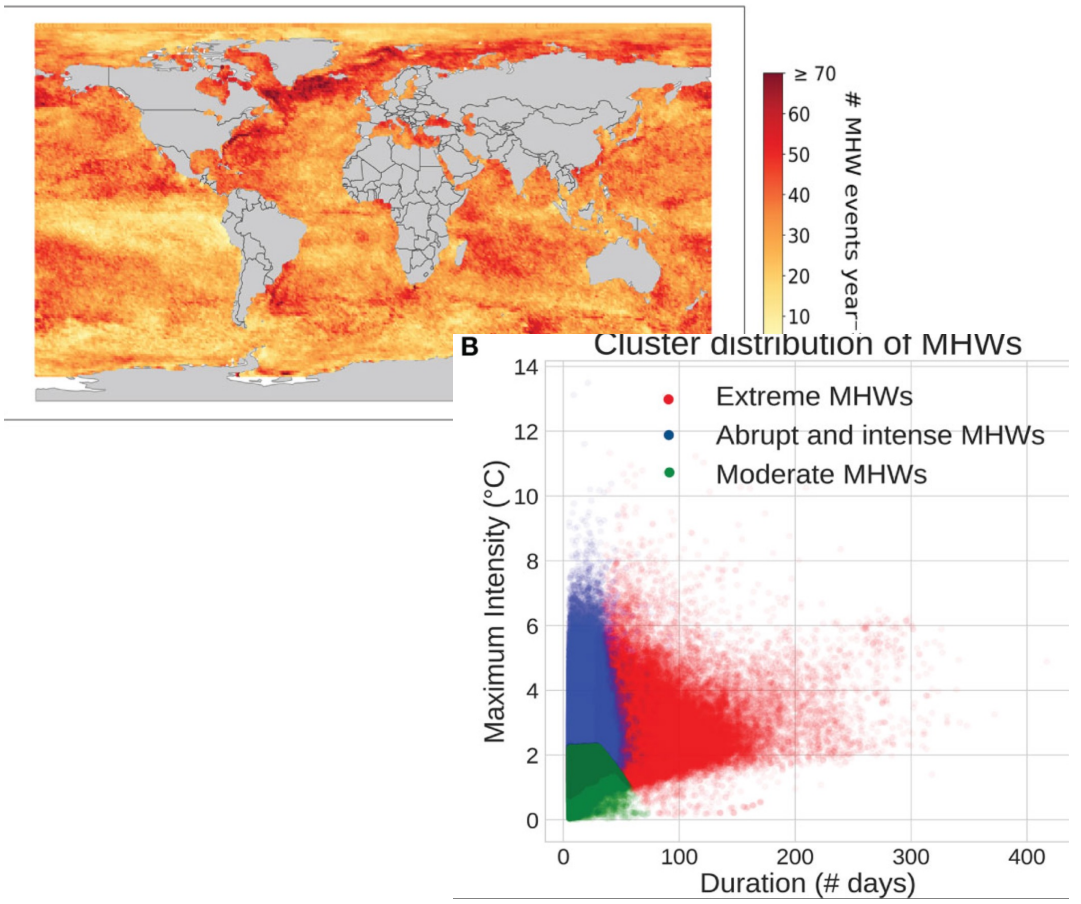
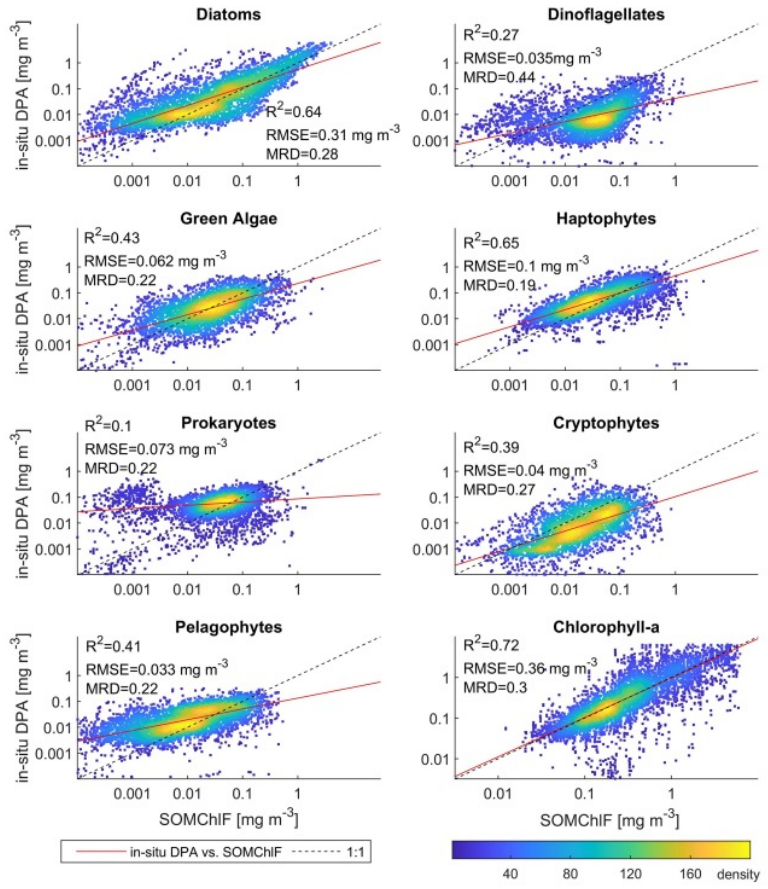
Ecosystem anomaly detection





Project Description:

The project aims to develop deep learning approaches to map and understand phytoplankton community composition and its response to environmental change using multi-source remote sensing and in-situ datasets. Neural network classifiers will be used to characterize phytoplankton diversity from decades of Copernicus data, supported by pigment data from MareDat and metagenomic data from Tara Oceans. The project also involves detecting temperature extremes and linking them to in-situ sampling. By integrating these datasets, causal relationships between sea surface temperature variability and phytoplankton community dynamics will be explored to assess the physiological responses of marine ecosystems to environmental stressors.

Learning Objectives:

- Learn to preprocess and integrate multi-source datasets (satellite, in-situ, and genomic/HPLC).
- Gain experience in developing and training neural network for classification and prediction.
- Acquire skills in detecting and analysing environmental extremes and their biological impacts.
- Develop competence in interpreting the relationships between physical drivers and biological.

Required Competences:

- Background in oceanography, environmental science, or data science.
- Familiarity with remote sensing data (e.g., ocean colour, SST) and analysis tools (e.g., Python).
- Experience in machine learning and neural network frameworks (e.g. PyTorch).
- Understanding of statistical methods for environmental data analysis and causal inference.

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Linked to EU H2020 project MARCO BOLO **References**: El Hourany, R., Pierella Karlusich, J., Zinger, L., Loisel, H., Levy, M., & Bowler, C. (2024). Linking satellites to genes with machine learning to estimate phytoplankton community structure from space. Ocean Science, 20(1), 217-239.