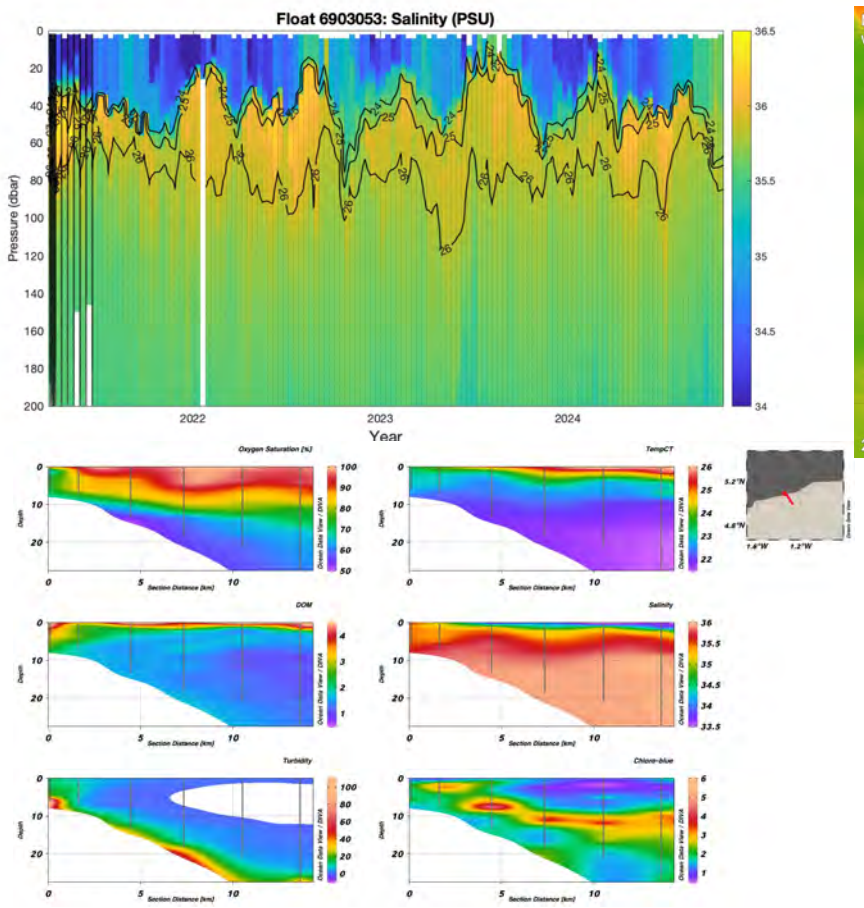
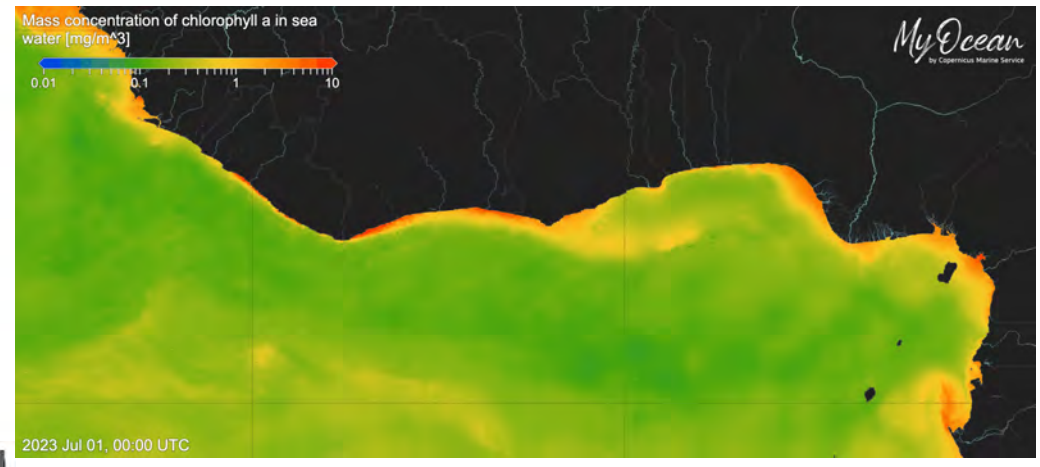
Ghana Upwelling System





$$\rho\left(\frac{\partial \mathbf{v}}{\partial t} + \mathbf{v}\cdot\nabla\mathbf{v}\right) = -p + \nabla\cdot\mathsf{T} + \mathbf{f}$$

Project Description

The Ghana Upwelling System (GUS) in the northern Gulf of Guinea is a crucial seasonal phenomenon, characterized by the injection of cold, nutrient-rich, subsurface waters that fuel high primary productivity, directly supporting Ghana's vital artisanal fishery. This project undertakes a multi-sensor, multi-scale oceanographic analysis to characterize the system's physical and biological variability over the last two decades. The analysis integrates three primary data types: remote sensing data (Sea Surface Temperature and Chlorophyll-a), vertical profiles from ARGO floats, and recent in-situ data (for validation and ground-truthing). The primary goal is to describe the dynamics, quantify the seasonality and inter-annual variability of the upwelling, and statistically link this environmental variability to fluctuations in fishery landing statistics for key species.

Learning Objectives

- Explain the physical drivers that govern the seasonal and inter-annual variability of GUS.
- Accessing, managing, and integrating large-volume multi-platform oceanographic datasets.
- Apply methods to derive and analyze upwelling proxies and map their spatial footprint from remote sensing and ARGO data
- Perform robust time-series analyses to identify and distinguish between variability and trends.
- Quantify the relationship between physical oceanographic variability and local fishery landings.

Competences to develop:

- Basic knowledge of physical oceanography, marine ecology, or fisheries science.
- Scientific programming language (e.g., Python or R) for data handling, modeling, and visualization.
- Understanding of geospatial data formats (e.g., NetCDF, HDF) and fundamental remote sensing concepts.

Notes: References Patrizio Mariani, pmar@dtu.dk , Rafael Gonçalves-Araujo rafgo@aqua.dtu.dk , Andre Visser awv@aqua.dtu.dk