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Diagnosis and Projection of Mediterranean Sea Warming Trends within the Framework of a Generalized Workflow

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The Mediterranean Sea is experiencing accelerated warming, outpacing the global ocean average according to recent studies. This regional basin is particularly susceptible to the effects of climate change due to its unique topography and thermohaline circulation patterns. Observational data and model reanalysis have documented significant changes in the characteristics of Mediterranean water masses.

One of the best indicators of this alarming trend is the Ocean Heat Content (OHC). The challenge of this research manifests in the implementation of a cloud-based workflow to estimate the OHC, assessing its evolution in user-defined sub-regions or depth layers within the Mediterranean basin. This application developed within the EU Blue Cloud 26 project framework, has the ambition to access data machine-to-machine data from multiple blue data infrastructures (SeaDataNet, Copernicus Marine Service, EuroArgo, World Ocean Database) available to the scientific community.

The workflow will use the DIVAnd tool to map historical in situ temperature data on a regular grid and the results will be compared to ocean reanalysis products from INGV and the Copernicus Marine Service.

The analysis will focus on identifying OHC trends, with a specific emphasis on understanding the implications of these changes for the region's climate system.

We expect the results to highlight the spatial variability of warming trends within different sub-regions and depth layers, underscoring the complex interplay between hydrodynamics and climate change in shaping the Mediterranean's thermal structure.

Moreover, by leveraging this workflow, we ensure that ocean key variables are consistently updated and validated according to the most recent community practices. The effort conducted will allow us to have a key indicator, such as OHC, rapidly available and constantly updated according to the most recent data, thus supporting an informed and efficient decision.

Finally, this study will contribute to the broader understanding of regional climate dynamics and provide valuable insights into the diagnosis and projection of extreme weather events in the Mediterranean Sea within the context of a changing climate environment.