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Trends and interconnections of physical parameters in the upper layer of the Mediterranean Sea

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The Mediterranean Sea is considered a hot spot of the global warming since it is changing faster than the global ocean, with a strong impact on the marine environment. Recent studies agree on the increase of the sea level, of the Sea Surface Temperature (SST), and of the Sea Surface Salinity (SSS) in the Mediterranean Sea over the last two decade, but no one has yet come to interconnect these and other parameters that contribute to the regulatory effect of the sea on the climate.

In this study, interannual variability and decadal climatic trends in the upper-layer of the Mediterranean Sea are estimated in the last 26 years using in-situ data (Argo float), satellite (altimetry, SST, wind vorticity, freshwater fluxes, mixed layer depth) and model (SSS) products.

Spatio-temporal variability is studied performing the Empirical Orthogonal Function analysis on the gridded, monthly, de-seasonalized maps of all satellite and model data. The contribution of the western, central and eastern regions of the Mediterranean Sea to the total trends is assessed. SSS distribution and trends derived from model reanalysis are compared with those derived from Argo float data in the upper layer.

Possible relationships between the trends in different datasets are delineated and described, i.e. the connection between the sea level rise and the SST, between the freshwater fluxes and the SSS, between the SSS and the ocean dynamics, including Ekman and geostrophic transports as well as vertical entrainment.

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