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Phytoplankton blooming off the Tyrrhenian coastal site: comparison between in situ observations and CMEMS MEDSEA products

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Coastal areas, especially those characterized by high anthropogenic pressure, need to receive an increasing concern from the oceanographic community. The knowledge of the biological processes occurring in coastal areas is linked to the knowledge of phytoplankton dynamics, that represents a primary driver of chemical and biological dynamics in the coastal zone and affect water quality, biogeochemical cycling of reactive elements and food supply to consumer organisms. For these reasons planktonic communities are considered in different descriptors of the MSFD (D1, D4 and D5).

Long-term high-resolution observations (weekly sampling from 2012 to 2017) of phytoplankton biomass at a coastal site from C-CEMS (central Tyrrhenian Sea) are presented and compared with the analysis data provided by the Copernicus Marine Environment Monitoring Services for the Mediterranean Sea (CMEMS MEDSEA ANALYSIS, generated by the MedBFM model system) and with satellite observations (from CMEMS Ocean Colour database). The integration of the in-situ observations with satellite data and model outputs provides the most exhaustive representation of the phytoplankton dynamics at coastal scale.

The analysis of the time series of phytoplankton provided by in situ, satellite and model data show the typical dynamics of temperate climate, characterized by spring and autumn blooms, together with a significant interannual variability. The qualitative agreement among the datasets is fair (particularly during elevated phytoplankton concentrations, for example in 2017 spring bloom), even though, due to the specific characteristics of the coastal site, some quantitative discrepancies are evident.

Notwithstanding the incongruences, specifically related to the model outputs, which underestimate the in situ and satellite data that are related to some representativeness error (e.g. river nutrient inputs based on climatological information and grid resolution), the intercomparison is beneficial to provide information at different temporal and spatial scales of the phytoplankton dynamics. Indeed, in situ data describe the very local dynamics by integrating all the on-site physical and biogeochemical processes, satellite data provide the evolution of the surface chlorophyll patterns at high resolution, and model gives information on the 3-D structure of the physical and biogeochemical processes, quantifying the role of the different drivers. The study will provide evidence of the importance of integrating the different contributions to gain knowledge of the ecosystem coastal dynamics.