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The Mediterranean subsurface chlorophyll dynamic and its impact on the Mediterranean bioregions.

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Ocean bioregions are generally defined using remotely-sensed sea surface chlorophyll fields, based on the assumption that surface chlorophyll is representative of euphotic layer phytoplankton biomass. Here we investigate the impact of subsurface phytoplankton dynamics on the characterisation of ocean bioregions. The Mediterranean Sea is known for its contrasting bioregimes despite its limited area, and represents an appropriate case for this study. We modelled this area using a high resolution regional dynamical model, NEMO-MED12, coupled to a biogeochemical model, PISCES, and focused our analysis on the bioregions derived from lower trophic levels. Validated by *Bio-Argo* observations, our model shows that chlorophyll phenology can be significantly different when estimated from surface concentrations or integrated over the euphotic layer. This was found in both low chlorophyll, oligotrophic bioregions as well as in high chlorophyll, bloom bioregions. The underlying reason for this difference is the importance of subsurface phytoplankton dynamics, in particular those associated with the Deep Chlorophyll Maximum (DCM) at the base of the upper mixed layer. Subsurface phytoplankton are found to significantly impact the bloom bioregions, while in oligotrophic regions are of similar productivity to the surface layer. Consequently, our results show that surface chlorophyll is not representative of total phytoplankton biomass. Analysis of the DCM finds that it is extremely homogeneous throughout the Mediterranean Sea, and that it follows the annual cycle of solar radiation. In the most oligotrophic bioregion, the total phytoplankton biomass is almost constant along the year, implying that the summertime DCM biomass increase is not due to DCM photoacclimation, nor an increase of DCM production, but instead of the "migration" − with photoacclimation − of surface phytoplankton into the DCM.