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Predicting the green ocean: main achievements from the Copernicus Marine Service biogeochemical models and perspectives.

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The prediction of marine biogeochemical cycles and ecosystems (the green ocean) has made significant progresses during the last two decades. The green ocean is now forecasted every day and multi-decadal reanalyses and projections are routinely produced with an always increasing resolution and over longer periods. The quality of the green ocean products has increased thanks to the improved model formulations, resolution and data assimilation systems. Here we will review the progress in our capabilities to predict the green ocean in the frame of the European Copernicus Marine Service (CMS) since its start in 2014 and for the 5 European seas, the Arctic and Global oceans. The evolutions of the prediction systems (e.g. model formulations, data assimilation, coupling with the physics and at the interfaces) and delivered products (e.g. resolution, quality assessment, adequacy to support the development of indicators and the decision-making process) will be reviewed. The predictability drivers and relevant time scales for marine biogeochemical cycles and ecosystems predictions will be discussed. Recommendations for future developments will be proposed based on a SWOT analysis of current CMS green ocean prediction systems and products.