Characterization of an anomalous 2022 deep water formation and bloom event in the southeastern Mediterranean Sea

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The biogeochemical seasonal cycle in the open sea areas of the Mediterranean is characterized by late-winter early-spring phytoplankton blooms driven by vertical mixing events that bring nutrients to surface layers (consistently with the Sverdrup conceptual model). Relatively intense bloom events are usually observed in areas where mixing is strong and persistent enough to significantly impact concentration of nutrients in surface layers. A markedly intense bloom following a strong mixing event was predicted in spring 2022 in an unusual area southeast of Crete by the analysis and forecasting systems of the Med-MFC, the production centre of the Copernicus Marine Service for the Mediterranean Sea. Satellite surface temperature measurements and numerical estimates suggest a sudden local cooling at the surface while observations from OC-TAC (the Copernicus Marine production centre for satellite ocean colour) show an anomalous chlorophyll intensity in the area. Thanks to the three-dimensional description of ocean physical and biogeochemical dynamics at relatively high resolution (1/24°) provided by the Med-MFC system, it has been possible to investigate various elements of the spring 2022 event. In particular chlorophyll was 50% higher than usual, and patches of high chlorophyll concentration lasted for 3/4 weeks. Results show that the spring 2022 event is particularly strong with respect to the climatology of the area and provide indications on the impact on primary production in the area, as well as on the relationship between the bloom and the atmospheric and marine physical processes, e.g., dense water formation and mixing. Finally, this study highlights the Med-MFC capability of monitoring in near real time ocean health conditions and extreme marine events.