Phytoplankton *in vivo/in situ* observations by novel automated optical approaches in coastal and marine systems: towards a better integration into joint observatories.

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Abstract:

During the last decade, *in vivo/in situ* techniques for monitoring phytoplankton have been explored and implemented in marine systems, in the frame of different collaborative national or international projects. As this compartment plays a crucial role in supporting food webs and mediating biogeochemical cycles, it became crucial to complete discrete sampling and laboratory methods in order to address this compartment at its finest temporal and spatial scale. Within the "Joint European Research Infrastructure network for Coastal Observatories – Novel European EXperTise" (JERICO-NEXT), scientists from different countries proceeded to the implementation of phytoplankton automated techniques based on single cell/particle or bulk optical characteristics, in coastal systems ranging from oligotrophic (West Mediterranean) to mesotrophic and eutrophic marine waters (Channel, North Sea & Baltic Sea). When implemented in automated environmental monitoring platforms (fixed stations, moorings, research vessels and/or ships of opportunity), they represented early-warning systems in water quality through phytoplankton abundance composition changes and the occurrence of blooms, including harmful algal blooms HAB, of special interest in areas of fishing, aquaculture and tourism. Now that we're moving into the UN Decade of the Ocean, in order to generalize the implementation of these approaches, the JERICO-S3(Science, Services, Sustainability) project seeks to standardize as much as possible their operability and capacity in addressing phytoplankton diversity and productivity. Moreover, automated tools for data analysis based on different machine-learning and classification approaches and definition of common vocabulary will allow to integrating these data into international databases available for research and marine management.