Phytoplankton monitoring: pulse shape recording flow cytometry for an in situ high resolution observing approach

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Abstract

Phytoplankton cells are one of the most important parts in biogeochemical processes in the ocean since they drive the marine food webs and are one of the major producers of organic matter. Phytoplankton observation in the ocean is a challenge in oceanology, accurate estimation of their biomass and their dynamics will help in understanding ocean ecosystems, refines global climate models, and may help in harmful algae bloom detection. The study of phytoplankton was considered inaccessible in its entirety because its size range varies on 3 orders of magnitude, its concentration varies from few cells to thousands per cm3, and its diversity is represented by more than 5,000 species. New automated dedicated flow cytometers (Cytobuoy, NL) were built in order to cover the entire size range of phytoplankton cells by scanning each cell passing through the laser beam, taking images of the largest of them for taxonomical identification, and by analyzing high volumes (up to 4 cm3) of sample. For the first time, such flow cytometer was directly connected to water inlet of a pocket Ferry Box during a cruise in the North Sea in May 2011 (DYMAPHY project, INTERREG IV A "2 Seas"), in order to resolve both hydrological and biological data of near surface waters (6 m) on a high resolution basis. Several groups of cells distinguished on the basis of their pulse shapes were described and abundances varied depending on the hydrological status of the crossed waters. The very purpose of this experiment was to combine those data with the PHYSAT satellite data algorithm in order to refine it, to define small scale changes in phytoplankton assemblages and functional biogeochemical groups and to study optical properties of the cells based on their fluorescence and diffusion profiles as a proxy of their physiological status. First results of the experiment will be presented and discussed.

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