

Publication MIO : R.Leroux (MIO), G.Gregori (MIO), K.Leb Blanc (MIO), F.Carlotti (MIO), M.Thyssen (MIO), M.Dugenne (MIO), M.Pujo-Pay, P.Conan, M.-P.Jouandet, N.Bhairi (MIO), L.Berline (MIO) - Combining laser diffraction, flow cytometry and optical microscopy to characterize a nanophytoplankton bloom in the Northwestern Mediterranean

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Abstract :

The study of particle size distribution (PSD) gives insights on the dynamics of distinct pools of particles in the ocean, which reflect the functioning of the marine ecosystem and the efficiency of the carbon pump. In this study, we combined continuous particle size estimations and discrete measurements focused on phytoplankton to describe a spring bloom in the North West Mediterranean Sea. During April 2013, about 90 continuous profiles of PSD quantified through in situ laser diffraction and transmission (the Laser in situ Scattering and Transmission Deep (LISST-Deep), Sequoia Sc) were complemented by Niskin bottle samples for flow cytometry analyses, taxonomic identification by optical microscopy and pigments quantification. In the euphotic zone, the PSD shape seen by the LISST was fairly stable with two particle volume peaks covering the 2–11 μm and 15–109 μm size fractions. The first pool strongly co-varied with the chlorophyll fluorescence emitted by phytoplankton cells. In addition, over the 2–11 μm fraction, the LISST derived abundance was highly correlated with the abundance of nanophytoplankton counted by flow cytometry. Microscopy identified a phytoplankton community dominated by nanodiatoms and nanoflagellates. High correlation of LISST derived particle carbon and Particulate Organic Carbon and high nitrogen in the Particulate Organic Matter also supported a dominance of actively growing phytoplankton cells in this pool. The second, broader pool of particles covering sizes 15–109 μm was possibly microflocs coming from rivers and/or sediments. This study demonstrates the complementarity of continuous measurements of PSD combined with discrete measurements to better quantify size, abundance, biomass, and spatial (both vertical and horizontal) distribution of phytoplankton in open ocean environments.

Keywords :

Phytoplankton

Particles

LISST

Flow cytometry

Optical microscopy

POC

Mediterranean Sea

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