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Preliminary experiments to estimate the PE.MA.M (PElagic MArine Mesocosm) offshore behaviour

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The phytoplankton community is controlled not only by local environmental conditions but also by physical processes occurring on different temporal and spatial scales. Hydrodynamic local conditions play an important role in marine ecosystems. Several studies have shown that hydrodynamic conditions can influence the phytoplankton settling velocity, vertical and horizontal distribution and formation of cyanobacterial blooms. Mesocosms are useful structures to simulate marine environment at mesoscale resolution; allowing to closely approximate biotic or abiotic parameters of interest directly in nature.
In this work an innovative structure named PE.MA.M (PElagic MArine Mesocosm) is presented and tested. Laboratory experiments have been conducted in order to observe seasonal variations of biomass behaviour in two different hydrodynamic conditions: outside as well as whithin the PE.MA.M. We have evaluated whether it is possible to isolate a natural system from external water mass hydrodynamic exchanges and to assume that phytoplankton cells' transition is limited at the net and sea interface.
Preliminary experiments test the isolating capacity of the net, to determine the currents' attenuation rate and to estimate the possible PE.MA.M. offshore behaviour.
In the first investigation, we monitored the diffusion of phytoplankton cells. The PE.MA.M. exterior and interior were simulated using a plexiglass tank divided into two half-tanks (Aout-Bin) by a septum consisting of a net like a PE.MA.M. The tank was filled up with 10 L of water and only the half-tank Aout was filled up with 10 ml of phytoplankton culture (Clorella sp.).
We monitored the chlorophyll concentrations for 24 hours. The two tanks had similar concentrations after 4 hours (2.70322 mg/m^3 Aout and 2.37245 mg/m3 Bin) and this constant relationship was maintened until the end of the test.
In the second investigation we used clod cards to measure water motions.We conducted two experiments within tank, the first was conducted by inserting the net PE.MA.M. between the water flow and the clod cards; the second was performed without the net. We calculated the dry weight of the clod cards in two steps: before placing them in water (Wi) and after 6 hours under the flow (Wf). We used the formula (Doty, 1971 Thompson & Gleen, 1994), to calculate the flow attenuation capacity of the PE.MA.M net.
The experiments showed that the PE.MA.M. is in equilibrium with the external environment after 4 hours; it isolates constant concentration of chlorophyll a and attenuates the flow of currents of about 30% .The PE.MA.M. is a potential tool in the phytoplankton community, in the absence of natural hydrodynamics,that can provide useful informations for the understanding of physical phenomena and how their changes affect biological processes.