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Modeling of the impact of Rhone River nutrient inputs on the dynamics of planktonic diversity

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Recent studies devoted to the Mediterranean Sea highlight that a large number of uncertainties still exist particularly as regards the variations of elemental stoichiometry of all compartments of pelagic ecosystems (The MerMex Group, 2011, Pujo-Pay et al., 2011, Malatonne-Rizotti and the Pan-Med Group, 2012). Moreover, during the last two decades, it was observed that the inorganic ratio N:P ratio in among all the Mediterranean rivers, including the Rhone River, has dramatically increased, thus strengthening the P-limitation in the Mediterranean waters (Ludwig et al, 2009, The MerMex group, 2011) and increasing the anomaly in the ratio N:P of the Gulf of Lions and all the western part of NW Mediterranean. At which time scales such a change will impact the biogeochemical stocks and fluxes of the Gulf of Lion and of the whole NW Mediterranean sea still remains unknown. In the same way, it is still uncertain how this increase in the N:P ratio will modify the composition of the trophic web, and potentially lead to regime shifts by favouring for example one of the classical food chains of the sea considered in Parsons & Lalli (2002). To address this question, the Eco3M-MED biogeochemical model (Baklouti et al., 2006a,b, Alekseenko et al., 2014) representing the first trophic levels from bacteria to mesozooplankton, coupled with the hydrodynamical model MARS3D (Lazure&Dumas, 2008) is used. This model has already been partially validated (Alekseenko et al., 2014) and the fact that it describes each biogenic compartment in terms of its abundance (for organisms), and carbon, phosphorus, nitrogen and chlorophyll (for autotrophs) implies that all the information on the intracellular status of organisms and on the element(s) that limit(s) their growth will be available. The N:P ratios in water, organisms and in the exported material will also be analyzed. In practice, the work will first consist in running different scenarios starting from similar initial early winter conditions (for which the sea surface layer is well mixed). As a first step, these scenarios will allow to investigate the impact of changes in the N:P ratios of the Rhone River on the structure of the planktonic community at short time scale (two years).

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