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Exploring the link between small-scale hydrodynamic properties and harmful phytoplankton blooms in the Ebro Delta (NW Mediterranean)

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Understanding the dynamics of harmful algal blooms (HABs) requires insight on the interactions between environmental physical processes and the biology of the involved species. This is particularly relevant in the case of dinoflagellates, a phytoplankton group that exhibits a physiological sensitivity to small scale turbulence, and that includes several HAB producing species, some of them toxic.

We developed a field work program in Alfacs Bay (Ebro Delta, NW Mediterranean) with the objective of investigating the relationships between the small-scale hydrodynamic properties (turbulent kinetic energy dissipation rates - epsilon-, shear) in the bay waters and the population dynamics of noxious phytoplankton species. The Alfacs Bay estuary is an intensive aquaculture site where recurrent harmful events caused by toxic dinoflagellates and diatoms occurr. Dinoflagellates blooms have lead to repeated long-lasting closures of bivalve harvesting.

We deployed an acoustic Doppler current profiler (2MHz Aquadopp, Nortek) that provided an almost continuous record of the velocity fields in the water column of a fixed station since April 2007. In addition, we carried out a weekly monitoring of biological (chlorophyll concentration, phytoplankton species composition) and physical variables (vertical CTD) along with monthly SCAMP microstructure probe profiles. Meteorological data were obtained from a land station nearby the sampling point.

During the sampled period, from April 2007 to January 2008, two main bloom events occurred. The ichthyotoxic dinoflagellate *Karlodinium* spp. proliferated during two months (June - July 2007), reaching maximum concentrations of ca. 1.5x10^{-6} cell$\cdot$L^{-1}, while chlorophyll increased up to 30 μg$\cdot$ L^{-1}. Thereafter, during September and October, *Pseudonitzschia* spp., amnesic shellfish toxin producer diatoms, bloomed to ca. 1.5x10^{-6} cell$\cdot$L^{-1} and chlorophyll concentrations reached 7 μg$\cdot$ L^{-1}. In this presentation we will analyse the relationships between the meteorological forcing, the hydrodynamic measurements (eg. shear and dissipations rates) and the phytoplankton distributions during these two biologically relevant periods, and we will discuss the influence of physical forcing on the development, maintenance and fate of specific microalgal blooms in Alfacs Bay.