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To what extent fluid motion at medium-small scale affects pelagic biota dynamics?

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Pelagic organisms lead their life in a fluid whose scales of motion span over, at least, 10^6 orders of magnitude, therefore affecting processes ranging from chemical diffusion to migration patterns. Small organisms (10^{-6}-10^{-2} m) are important components in the functioning of the marine food webs. Therefore the small scale fluid motion may play a crucial role in determining the species composition and abundance in the pelagic communities. This has been perceived since the pioneering studies of marine ecology, e.g., Margalef Mandala, and has been recurrently analyzed starting from the seminal study by Rotschild & Osborn in 1988, for what plankton contact rates concerns.

Each class of those organisms is affected in different ways by the motion of the fluid through the modulation of their interactions with both the biotic and abiotic components of the environment. Those, in turn have been better observed, characterized and quantified during the last two decades due the impressive improvement of techniques and computational power. The emerging picture is quite complex. It strongly supports the hypotheses that fluid motion at small scale affects rates in the intake of solutes and particles, in the growth rates of organisms, and their behavior, but it does not allow a full understanding of their overall impact on relevant aspects of marine ecology and evolution.

For example, not all the basic mechanisms that are underneath the species succession projected in the phase space as in the Margalef Mandala have been tested and proven. It has not yet established whether being adapted to calm or turbulent water is more important that having developed endogenous controls or defense mechanisms in the attempt of being more successful than competitors. Evidence of regional variations

of thresholds in the responses of phytoplankters to varying turbulence suggests, but does not necessarily supports, their relevance in shaping the structure of community. Finally, it is an open question whether the selective pressure due to the fluid motion, *per se*, is still a relevant term in determining the biota reaction to long term changes in the marine environment.

The above issues will be discussed in the light of the significant observational, experimental and theoretical efforts recently conducted on this topic in the scientific community.