

Abstract #88633

Major role of nutrient supply in the control of picophytoplankton community structure

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Abstract Text:

The Margalef's mandala (1978) is a simplified bottom-up control model that explains how mixing and nutrient concentration determine the composition of marine phytoplankton communities. Due to the difficulties of measuring turbulence in the field, previous attempts to verify this model have applied different proxies for nutrient supply, and very often used interchangeably the terms mixing and stratification. Moreover, because the mandala was conceived before the discovery of smaller phytoplankton groups (picoplankton <math><2\ \mu\text{m}</math>), it describes only the succession of vegetative phases of microplankton. In order to test the applicability of the classical mandala to picoplankton groups, we used a multidisciplinary approach including specifically designed field observations supported by remote sensing, database analyses, and modeling and laboratory chemostat experiments.

Simultaneous estimates of nitrate diffusive fluxes, derived from microturbulence observations, and picoplankton abundance collected in more than 200 stations, spanning widely different hydrographic regimes, showed that the contribution of eukaryotes to picoautotrophic biomass increases with nutrient supply, whereas that of picocyanobacteria shows the opposite trend. These findings were supported by laboratory and modeling chemostat experiments that reproduced the competitive dynamics between picoeukaryote and picocyanobacteria as a function of changing nutrient supply. Our results indicate that nutrient supply controls the distribution of picoplankton functional groups in the ocean, further supporting the model proposed by Margalef.

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