INSUE - PROGRAM "PROcessus biogéochimiques dans l'Océan et Flux " - PROOF

Production and Exportation of Carbon : Control by Heterotrophic organisms at small time scales

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PECHE is designed to better understand and evaluate the relative contribution of heterotrophs (from bacteria to macrozooplankton) and physical forcings in the control of primary production (top-down and bottom-up), export to depth and mineralization.

Processes at small time scales will be specifically examined, as it may be vital for calculating reliable budgets for the long term periods (seasons to years). Seasonal transition rich in episodic events (mixing, wind, zooplankton migration) appears particularly critical in this context.

The project will examine the short-term variability of primary production and export fluxes through the twilight zone to depth, and the overall response of the system to episodic events during a seasonal transition period.

SPECIFIC OBJECTIVES

* To study the role of structural and functional diversity of zooplankton community in the control of primary production and in the release of organic resources for bacteria (succession of dominant species, grazing pressure, predator/prey relationships, dial vertical migration, faecal pellet production).

* To better measure bacterial hydrolysis versus assimilation rates of organic resources and to infer its role in detritus export to depth (structural and functional diversity, aggregates and faecal pellet utilisation, process of decomposition *versus* preservation, role of physical gradients).

* To estimate the response of the ecosystem at small time scales of a few hours to a few days.

STRATEGY

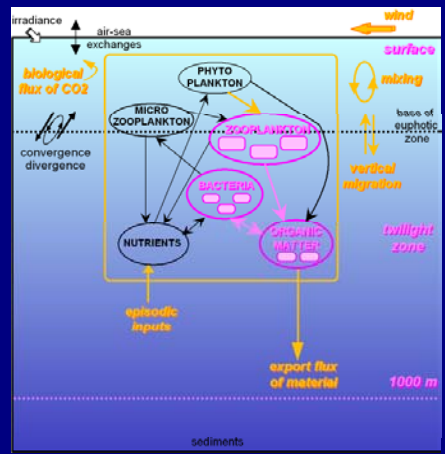
This study relies on the exploration of different trophic conditions from the surface to 1000m depth) in a site where advective movements are negligible (central zone of the Ligurian Sea, NW Mediterranean).

Abundance of zooplankton functionnal groups (copepods, salpes, pteropods), cruise : PROPECHE 1
Day/night scale, 8 days, Avril 1-15 2003 (N/O Téthys II)

Seasonal decrease of particle flux, cruise PROPECHE 2
Day/night scale , 8 days, June 15-30 2003 (N/O Téthys II)

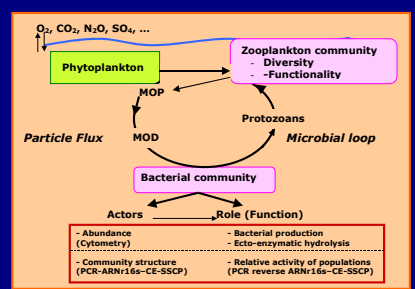
Abundance of microphageous organisms, episodic inputs of deep nutrients, seasonal transition, multidisciplinary cruise : DYNAPROC 2 (DYNAmics of rapid PROCesses in the water column)
short term variations (hours to days)
35 days, September-October 2004 (N/O Thalassa)

GENERAL SCHEME OF THE PECHE STUDIES



The parameters and the biological processes related to heterotrophy (pink) and physical forcings (yellow) which will be studied in details in the PECHE project are presented. The multidisciplinary study of the system will integrate all these approaches.

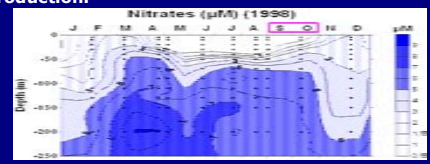
HETEROTROPHIC PROCESS STUDY



BACKGROUNDS FOR THE MULTI DISCIPLINARY STUDY

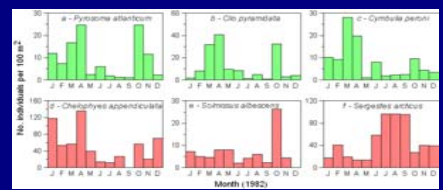
The optimum period to conduct the DYNAPROC 2 cruise was chosen according to monthly observations previously made in the Ligurian sea, and particularly at the Dyfamed time-series station.

Wind-induced mixing events can increase availability of nutrients in the euphotic layer in September-October, as suggested by the shoaling of the nitrate surface (below). However, monthly observations are not sufficient to appreciate bottom-up control of primary production.



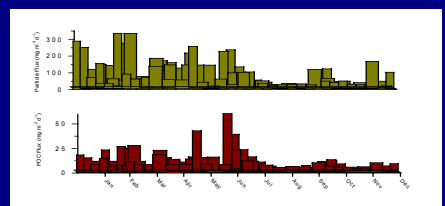
Marty et al. 2002 (DSR II 49)

Microphageous organisms (such as pyrosomids (a) and pteropod molluscs, b-c) occur in large densities in autumn and could control phytoplankton. Carnivorous gelatinous (d, e) increase after a summer minimum. Strong differences in species abundance between September and October, show that this period is transient between two trophic systems.



Sardou et al. (Oceanol. Acta 19)

Mass and POC fluxes exhibited a relative increase in October, after the summer minimum (4 years data set).



Miquel et al. (pers. comm.)

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