

TEMPORAL VARIABILITY OF BIOLOGICAL PARAMETERS IN THE NORTHWESTERN MEDITERRANEAN

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Although the spatial heterogeneity of the distribution (patchiness) of phytoplanktonic biomass is now commonly investigated, data concerning its temporal variability over long periods of time are still very sparse (see DICKEY *et al.*, 1992). This is first because of limited technologies, and second because no water color satellite is flying yet to replace the Coastal Zone Color Scanner. Such information is crucially needed though to correctly describe and quantify the variability of the biological parameters, and to investigate relations between dynamical and biological phenomena. A CNRS/NSF cooperation between the COM and USC has enabled us to obtain concurrent time series of biological and dynamical parameters for the first time in the Mediterranean, achieving one of EUROMODEL's objectives. From September 13 to November 10 1993, at a site approximately 10 nautical miles south of Marseilles, the BIOVAR mooring with 4 autonomous fixed-depth instruments Multi Variable Moored Sensors (MVMS, cf Fig. in DICKEY and TAUPIER-LETAGE, 1990) recorded every 4 minutes, the following parameters at 40, 50, 60 and 80 m (no data return from the 60 m MVMS, which was damaged): horizontal currents, temperature, conductivity, stimulated fluorescence of chl. *a*, natural fluorescence of chl. *a*, beam attenuation coefficient (c_{660nm}), dissolved oxygen, and PAR (Photosynthetically Active Radiation). The BIOVAR experiment was part of the French Programme National d'Océanographie Côtière (PNO), for which a transect (7 stations) crossing the Northern Current (MILLOT, 1991) at the entrance of the Gulf of Lions has been regularly sampled with CTD casts and concurrent determinations of nutrients, chlorophyll *a*, organic matter, and dissolved oxygen. Additionally, C^{14} *in situ* incubations ("Let Go") have been performed at station M3 for primary production estimations. During the fall of 1993, the weather was characterized by many strong wind events and heavy showers. Thus, our records might not be representative of typical fall conditions when there is commonly a secondary phytoplanktonic bloom. However, there was a high degree of variability as expected. For instance, there were several episodic dramatic increases in temperature ($\approx 5^\circ\text{C}$ at 40 and 50 m) related to meanders of the Northern Current, and the destruction of the thermocline at the end of October (Fig. 1). Diel variations were observed in chlorophyll concentration records, as well as variations on a time scale of a few days (e.g. from 0.2 to 0.8 $\mu\text{g/l}$ on Sept. 16 -17 at 50 m, Fig. 2). The present data set will be used to model primary production, and to derive significant means and variances of bio-optical parameters. The high variability which was observed, both in time and in space in the vertical, underscores the importance of an adequate sampling strategy. It has been shown, from previous MVMS data sets that errors in estimated gross primary production resulting from shipborne sampling aliasing can reach 80% (WIGGERT *et al.*, 1994). With the increasing need for models of primary production at basin and global scales, we need to have, in a dynamical context, a good description of the biologically-related parameters and more specifically, of their variability, in order to provide and to validate models with sound parameters. As a consequence, efforts must be made to develop autonomous multivariable instrumentation, especially in the profiling mode to achieve good vertical resolution, and to expand our observational database.

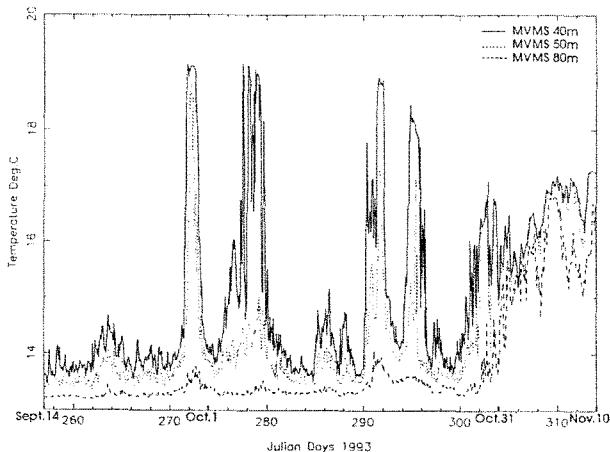


Fig. 1: BIOVAR mooring: superimposed time series of temperature

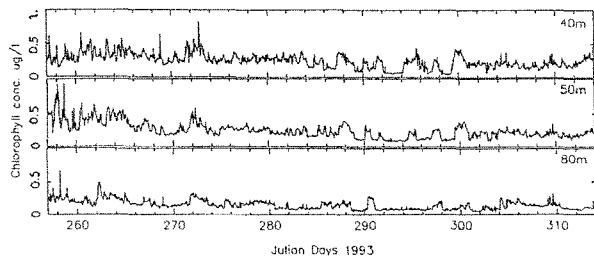


Fig. 2: BIOVAR mooring: time series of chlorophyll *a* concentration (in $\mu\text{g/l}$)

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