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Biogeosciences Discussions

Interactive comment on "Dynamics of microphytoplankton abundance and diversity in NW Mediterranean Sea during late summer condition (DYNAPROC 2 cruise; September–October 2004)" *by* S. Lasternas et al.

Anonymous Referee #2

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This ms describes the abundance of the microphytoplankton groups (diatoms, dinoflagellates) in late summer in the NW Mediterranean Sea. The objective and originality is reported in the abstract "Changes in marine phytoplankton communities over short-time scales have rarely been examined. We sampled nearly daily, and determined taxonomic composition and abundance of the main microplanktonic groups from both net and bottle sampling". The abundance and composition of the microphytoplankton in the late summer conditions (warm temperatures and stratification) are used to test the "Intermediate Disturbance Hypothesis".

This ms provides two tables with checklists of species of diatoms, dinoflagellates and silicoflagellates. Each table includes a second column for the authority, the author that describes the species. Is this relevant instead of useful data such as the maximal abundance of each species? Other results are presented as section plots of the abundance of total phytoplankton, diatoms, dinoflagellates and silicoflagellates, and other specific taxa such as Leptocylindrus, Scrippsiella and naked ciliates. There are not figures of hydrographical conditions, nutrients, etc. Although this ms is a part of an especial issue, data on fluorescence or the concentration of chlorophyll a are here necessary (for example for the numerous references to the deep chlorophyll maxima).

This ms remarks the originality of the daily sampling strategy. At first sight, this may be interpreted as a continuous sampling at a fixed station. Even, in a fixed station the phytoplankton communities vary according to phenomena such as the advection. Page 5166, line 24 "fixed station was occupied at least four time during the cruise". However, the results correspond to samples collected from 16 different stations along 17 days, with three lags in the sampling series. The authors remark at the beginning of the conclusions "This is one of the first detailed studies dealing with daily variations of microphytoplankton abundance and diversity". Please be conscious of the limitations of your sampling strategy. Two meteorological events modified the environmental conditions prevailing in later summer. These events should be considered important because the on-board operations in a ship such as R/V Thalassa were cancelled. These features should be useful in a paper that tries to test the 'Intermediate Disturbance Hypothesis' in the pelagic system. The figures 3 and 4 show the number of species and diversity indexes. None of these indexes showed a significant variation after these meteorological disturbances. There are two interpretations: plankton diversity does not change after disturbances or the method is unable to monitor these changes. The diversity indexes (Fig. 3) are calculated from the analysis of a sample volume of 100 ml collected in oligotrophic waters. This provides an insufficient number of specimens for the estimation of the diversity indexes. For example, the highest abundance of silicoflagellates is 400 cells L-1. A maximum of four specimens per sample implies a counting error always

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higher than 100% (see table 2 in Lund et al. 1958. The Inverted Microscope Method of Estimating Algal Numbers and the Statistical Basis of Estimations by Counting. Hydrobiol. 11, 143-70). For phytoplankton counting in oligotrophic waters is convenient the analysis of larger volumes (500-2000 ml) using settling cylinders. See a description of the method in Dolan et al. (2002) Microzooplankton diversity...; Deep-Sea Res I 49 1217-1232.

Studies on the phytoplankton abundance and diversity have been numerous. Margalef has extensively used the diversity indexes in Mediterranean Sea. However, it is unusual the absence of any citation to Margalef's ecological papers. The calculation of the diversity index requires a representative number of specimens in each sample and taxonomical expertise to differentiate the species.

This ms is presented as a detailed diversity study, including very rare species (Page 5165, line 27: it is necessary to take into account rare species). I have doubts on the accurate identification of common species. For example page 5178, line 15 "population of diatoms dominated by Corethron criophilum". The epithet "criophilum" means "cryophilic". Corethron criophilum was described from the Antarctic Ocean. It a common species in the cold waters of the Southern Ocean and the records in the northern hemisphere corresponded to C. hystrix (see Crawford et al 1998. Diatom Research 13, 1-28). An Antarctic diatom should not be dominant in a paper that reported several phytoplankton indicators of warming in the Mediterranean Sea.

This ms deals on the short-time variations. Phytoplankton species with a fast response (high growth rates) to the environmental changes are suitable for this objective. The dinoflagellate Ceratium is here considered a key genus to investigate the short-time variations in the phytoplankton composition. In the page 5184, line 23-24 is reported "the Ceratium species have relatively low growth rates, with doubling time ranging from two days to two months (Weiler, 1980)". In addition, Ceratium species showed mixotrophic behaviour. It is more honest to say that Ceratium has been used because the identification at the species level is easy for beginners in the phytoplankton identification.

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A species identified as Scrippsiella sp. is considered as an indicator of a coastal intrusion. The precise species identification is required because it is relevant for the results. Species such as Ceratium fusus and C. furca are also neritic bloom-forming species. However, the occurrence in open waters should not be considered intrusions of coastal waters. Taken into account that this ms is a part of a multidisciplinary oceanography study, please provide any evidence (hydrographical data, satellite image) of the coastal water intrusion.

The description of the methods is excessively long. For example it is not necessary to cite all the references used for the phytoplankton identification: Tregouboff and Rose (1957a, b), Dodge (1982), Sournia (1986), Balech (1988), Hasle and Syversten (1996), Steidinger and Tangen (1997).

The discussion is full of classical topics in phytoplankton ecology that are not related to the results here presented. I cannot go through all the text.

I focus on the conclusions:

"As DYNAPROC 2 is a multidisciplinary program, our results could easily be analysed in the view of physico-chemical and biological parameters, including zooplankton diversity and abundance as well as microbial community structure and activities. Our results highlighted the value of such data to complete and complement pigment analysis."

I have read the ms and I cannot find any example of the relation between these parameters and the results. For example, what is the relation between the dominance of Ceratium and the zooplankton diversity? What is the relation to the chemo-pigments?

"Moreover the theoretical ecology feature, the knowledge of microphytoplankton short term abundance and diversity evolution supplied complementary information of biogeochemical, biological and ecological interests. It allowed a better understanding of the interactions between autotrophs and nutrients as well as trophic relations with zooplankton".

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Interactive Comment

Please provide examples of the relation of the results and the biogeochemical fluxes. This is relevant for the readers of Biogeosciences.

"Species indicators confirmed the arrival of coastal water and the possible long term warming of NW Mediterranean. We also found some very rare dinoflagellates species, which need genetic analysis to clarify their phylogeny."

In a paper focused on the short time variations, the conclusion deals on aspects such as long term warming. The last sentence of the conclusion in a paper to be published in Biogeosciences remarks the importance of genetic analysis of very rare species. I disagree; very rare species (only observed each 40 years) have not a significant influence in the pelagic food webs. I do not consider the genetic analysis of rare dinoflagellates as a priority for future research in biological oceanography.

This paper should be presented as a description of the phytoplankton composition and abundance and the relationship to the environmental variables (temperature, salinity), nutrients and pigments. Phytoplankton identification is a laborious task carried out by a single individual. There is an excess of co-authors that does not contribute with any data. The authors should avoid originalities such as testing classical hypothesis in ecology and a discussion in topics that are not related to the dataset.

Interactive comment on Biogeosciences Discuss., 5, 5163, 2008.