**Biogeosciences
Discussions**

Interactive comment on "Ultraphytoplankton distribution and upper ocean dynamics in the eastern Mediterranean during winter" *by* M. Denis et al.

Anonymous Referee #1

Received and published: 25 September 2009

General comments: This ms reports data on hydrography and ultraphytoplankton abundance and biomass in the eastern Mediterranean. Although there have been numerous similar studies in the last two decades, this study containing a large dataset is valuable in that both the study location and time is relatively understudied. The data are useful for understanding the carbon cycles and the factors controlling ultraphytoplankton standing stocks in the ocean. The authors have made efforts trying to link environmental physical processes with the distribution of ultraphytoplankton and some apparent relationships have been derived.

I have been wondering if this kind of study can be improved by setting up mechanistic

relationships between environmental variables and ultraplankton distributions. For example, the authors have purposely shown that there are good relationships between seawater density or salinity differences and ultraplankton abundance differences (Figs. 7, 10, 13). Of course, this kind of relationship does exist. However, we know that the density or salinity themselves cannot directly act on ultraphytoplankton. The most relevant factors that affect ultraphytoplankton distributions are light intensity, nutrients, and grazing effect. I admit that some of the information might not exist. But based on the text, it appears that nutrient data are available. So I wonder whether the nutrient data can be described in more detail and be related with the ultraphytoplankton distributional patterns. Also, it would be nice to see how the physical processes such as eddies or fronts affect nutrient distribution. The situation also applies to light if the data of light intensity is also available. For example, is it possible to calculate the mixing rate of the water column and estimate the average solar irradiance that a phytoplankton cell receives daily? That would help to explain why ultraphytoplankton abundances at Station 17 with a deep MLD were much lower than at other stations (Fig. 6).

Another benefit of presenting detailed nutrient data is to explain why Synechococcus, instead of Prochlorococcus, dominated in this region, which is opposite with other studies (line 5, page 6862). It is well known that Synechococcus proliferate at relatively mesotrophic waters. Although the authors claimed the area was ultraoligotrophic and provided some nutrient numbers (line 13-15, page 6859), it is difficult to compare with other oligotrophic regions without detailed nutrient data.

Specific comments: Abstract 1. Page 6840, line 20-24, delete the last sentence as it does not tell any finding of the study.

Introduction 1. Page 6841, line 25, 'nutrient content' change to 'nutrient concentration'. Also Page 6842, line 14. 2. Page 6842, line 28, 'chlrophyll', typo, should change to 'chlorophyll'

Materials and methods 1. Page 6846, line 16, can the authors provide more information

about the flow rate and the analysis time? 2. Page 6847, line 8, can the authors explain a little more about how to estimate the biovolume by flow cytometry? 3. Page 6847, line 20, the reference cited (Brown et al. 1999) does not appear to be appropriate here since this study was conducted in the Arabian Sea.

Results 1. Consider to add nutrient data in the results section. 2. Page 6857, line 16, change 'correlation' to 'regression'. Also page 6860, line 17.

Discussion 1. Page 6862, line 1, 'species' change to 'group' 2. Page 6862, line 27-29, this problem should be mentioned in the method section. 3. Page 6863, I believe that it is not water density itself but light and nutrient conditions that affect the distribution of Synechococcus. When there is strong mixing, the average light that a cell receives will be smaller than that in a stratified environment and therefore the growth and biomass of Synechococcus will be negatively affected. If water transport is really important for ultraphytoplankton distributions, the authors should provide evidence showing that the water exchange rate is higher than or at least comparable with the division rate of ultraphytoplankton.

Figures 1. Fig. 13, put Depth (m) on the Y-axis.

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Interactive comment on Biogeosciences Discuss., 6, 6839, 2009.