

## ***Interactive comment on “Is the distribution of *Prochlorococcus* and *Synechococcus* ecotypes in the Mediterranean Sea affected by global warming?” by D. Mella-Flores et al.***

### **Anonymous Referee #1**

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General Comments: This is a Referee Comment on the manuscript titled, “Is the distribution of *Prochlorococcus* and *Synechococcus* ecotypes in the Mediterranean Sea affected by global warming?” by Mella-Flores et al. for Biogeosciences Discussion. The manuscript presents cyanobacterial abundance and molecular diversity data from a research cruise in the Mediterranean Sea and compares the results from a previous occupation several years prior. In general the data and analyses are of high quality and the results of the study are quite interesting and the manuscript is well-written. It is apparent that the authors spent a lot of time collecting, processing and analyzing the data and the results highlight that. The Mediterranean Sea is a particularly interesting region oceanographically so the results presented here, are important contribution

to the field – and the fact that the results are somewhat counter-intuitive makes them even more important to distribute. Although the data and analyses are interesting and point to future areas of research, I am somewhat confused by how the study has been framed and some of the specifics of the interpretation of the results, which are discussed in the specific comments section. Taking into account those comments below and others' and based on your results and interpretation already, you'll have a solid contribution.

Specific Comments: (1) The framing of the results. I'm not convinced of the temporal comparisons of the datasets or of the "global warming" comparison. Although conceptually interesting, the reality is that most of the stations and transects are different (fig 1). Further, based on the time-series studies that you cite (BATS, HOT) there is substantial variability even at a given station location over a year so two end points are less convincing. If you do head down this path, you'll have to make a more statistically convincing argument on how the environmental variables have changed (or not) and how these influence populations. For example, is the temperature increase (at most 1 C for station C) over the last 25years really expected to cause changes to the cyanobacteria. A more plausible effect would be changes to nutrient inputs or top down effects. (2) The discussion on page 4300 surrounding the dominance of *Synechococcus* is confusing to me given the data in Table 2 and Figures 2, 4 and 5 that show that *Prochlorococcus* is the numerically dominant cyanobacteria. If you measured mono-vinyl chlorophyll A you could estimate the percentage contribution of *Prochlorococcus* using the divinyl-portion, which could help to solidify your position (or refute it). Putting Figure 2 E and E on the same scale would help the reader make a better comparison between the populations, at least in terms of biomass. Also, I don't really follow the low-P argument for the "dominance" of *Synechococcus*. I think a more likely possibility is Cu toxicity, at least near the surface (Mann et al. 2002). (3) One of the more interesting findings from this study is the dominance of the HLI *Prochlorococcus* clade following the work of Garczarek et al. 2007. Perhaps this can be brought out more by exploring its relationship to environmental variables a bit more. This finding as well as the refining of niches of

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some of the *Synechococcus* clades is most compelling part of the observations.

Technical Corrections: Pg 4286 line 6: do you really mean “global warming.” Shouldn’t this be “global climate change” or may be just “environmental change.” No doubt a host of environmental variables have or could have changed over this period. Pg 4287 line 3: quantify “gentle filtration” Pg 4290 line 21: The real sequence accession numbers need to be added. Pg 4292 line 22: It would be good to remind us when the PROSOPE cruise occurred. Pg 4300 lines 19-25: There has also been similar work done with *Prochlorococcus* (Mann et al. 2002) and this should be referenced and fully considered as this seems like it could explain some of the findings here. Pg 4322, Table: Please list the integration depth (or feature). Pg 4325 Figure 3. You can delete the full equations and just put the slope with standard deviation for the estimate. You should also say if this slope is statistically different from zero.

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Interactive comment on Biogeosciences Discuss., 8, 4281, 2011.

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