

Interactive comment on “Seasonal variability of phytoplankton fluorescence in relation to the Straits of Messina (Sicily) tidal upwelling” by F. Azzaro et al.

Anonymous Referee #1

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This manuscript focuses the coupling between hydrological variability and distribution of phytoplankton (as estimated from fluorescence of chlorophyll a) in a very dynamic Mediterranean area where changes at different time scales are produced (tidal and seasonal cycle). The topic under research is very interesting as it could contribute to elucidate the underlying mechanisms implied in response of the phytoplankton standing stock to nutrient enrichment induced by upwelling. However, the manuscript presents serious flaws which affect the interpretation of the data. Additionally, some sections of the manuscript are confusing and it is not easy to understand how data were obtained and which new data (i.e. un-published data) are really presented in this manuscript. Finally, there are a lot of non-rigorous terms and grammatical errors

throughout the manuscript.

Introduction This section is too much large and many of the supplied references are not clearly connected to the paper. I propose that authors perform a summary of the two or three main points which describe the hydrological features of the study area. Also, it is necessary to provide a specific hypothesis since it is not evident how seasonal dynamic could influence the hydrology and chlorophyll a distribution in an area highly affected by the tidal regimen (i.e. low frequency variability).

Material and Methods Fluorescence of chlorophyll a must be used carefully as an estimator of concentration since wide differences in fluorescence to chl a ratio have been described in the literature. Besides, the relationship shown in Figure 5 (I assume that these data come from samples obtained in the study area) covers the concentration range 0.05 - 0.20 mg l⁻¹ while some values of concentration were higher than this higher limit. This extrapolation is not fully correct, as the relationship could become non-linear at these Chl a concentrations.

Results and Discussion

(1) Interesting diurnal variability of surface salinity and temperature is reported. Authors link this variability to changes in chlorophyll fluorescence as the correlation between fluorescence and salinity or nitrate was significant statistically. However, the determination coefficients for these relationships were very low, indicating that most of fluorescence variability should be attributed to other factors changing during the diurnal cycle (e.g. advection, incident irradiance \ddot{E}).

(2) From the data shown, it is not easy to establish if the inter-survey variability is plenty connected to seasonal variability or it was affected by some other non-seasonal factors. For example, I wonder if wind regime during the surveys plaid some role in modulation of the hydrological characteristics. On the other hand, it is also questionable if the salinity and chlorophyll surface distributions shown in Fig. 7 and 8 are really representative of the dynamics in the whole water column. As the authors mention, it

is necessary to know the vertical profiles in order to assess the effects of the seasonal hydrological mechanisms (e.g. stratification of the water column).

(3) Data were affected by different variability sources: horizontal gradients, diurnal and seasonal changes. It could be interesting to split out the effects of these different variability sources on the chlorophyll distribution in order to discern which is the main factor affecting it. For this proposal, it could be useful to apply a multivariate exploratory technique (e.g. principal component analysis). Authors can find good examples of application of these techniques to analysis of hydrological data in the Literature.

(5) Only in spring there were differences between the chlorophyll a concentration in low and high tide currents. Some explanation for this result should be provided.

(6) On average, the chlorophyll a concentration values were very low (even in spring) in comparison to other upwelling areas.

(7) Table 1. A statistical test for determination of the significance of the differences among the means should be applied.

Technical corrections

-I think that references cited in p.418 Line 3, are not directly related to the study area

-p.419, first paragraph, the biological compartments which were studied should be specified

- p.419, line 11 and p.420 line 5. These innovative strategies should be specified

- p.420, line 13. It is not clear what authors refer with “more evident chemical-physical and biological characteristics”

- p. 421, Line 12. I can not understand what “sampling strategy was validated” means.

- The equation relating fluorescence and Chl a concentration must be specified. Also, information about the method used for estimating chlorophyll a concentration is missed.

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