Ocean Science

Discussions

EGU

Interactive comment on "Coastal mesoscale processes and their effect in phytoplankton distribution and community composition in the SE Bay of Biscay" *by* Xabier Davila et al.

Anonymous Referee #2

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General comments

The manuscript describes mesoscale processes in the shelf of the Southern Bay of Biscay and tries to relate that physical environment with the occurrence and distribution of phytoplankton in the area. The approach presented is very interesting and the manuscript provides a detailed description of a snapshot of the circulation in the SE BoB in August.

I have to acknowledge that I am not an expert in ocean circulation, so although I found this part well described and thoughtful, I am not fully capable of reviewing the methodological details of the description of the mesoscale ocean processes.

Since my expertise includes the phytoplankton community of the BoB, my main concerns are related to the fact that the aim of the manuscript is to relate the physical environment to the phytoplankton community structure, and I found this connection poorly supported by the data presented.

First, phytoplankton distribution is presented though accessory pigments fluorescence data, which is variable depending on the proportion of accessory pigments with respect to chlorophyll and depending on the proportion of chlorophyll to phytoplankton carbon. I think these fluorescence data do not represent phytoplankton distribution as straightforward as the authors claim. Also, not all phytoplankton groups are presented in the results, only "green" and "brown" algae, which leaves out all the cyanobacteria, very relevant in the phytoplankton community of the BoB in summer.

Regarding writing and composition, the manuscript is a bit difficult to follow, the physical part is better explained (although there are some typos and acronyms not defined, listed below), but the biology part is very confusing, with many concepts not fully explained.

Specific comments

Introduction

25 That's an unclear sentence, it is not clear which is the subject (it?) of the first part.

27 "this cross-self transport" does refer to the complex ocean dynamics mentioned before (26)?

64 Some word is missing here: "different phytoplankton groups" or "different groups of phytoplankton".

74 MFSD not defined.

Methods

90 Is the FluoroProbe deployed together with the CTD casts?

95 Typo: "Cryoyptophytes" should read Cryptophytes.

138 I think there is a typo here: "enough resolution for resolving".

149 Another typo, a parenthesis or a preposition is missing: "of the analysed field (Gamis et al. 2001)".

150 The treatment of fluorescence data is not very well explained. Only the method to interpolate the values to a regular grid is explained. But regarding the FluoroProbe data themselves, if FluoroProbe provides Chla values (95) why are they not showed and it is instead fluorescence? Are the fluorescence values calibrated with filtered samples in any way? Even though chlorophyll is not the same as phytoplankton biomass (given the variability in the chlorophyll to carbon ratios), it is more interpretable and comparable among groups than fluorescence. Fluorescence is also variable depending on the content of accessory pigments which is also subjected to photoacclimation and hence variable with phytoplankton physiological state. That's for me the weakest point of the manuscript, that the fluorescence values presented hardly represent the actual biomass or abundance of the phytoplankton community.

160 This methodology is not very clear, "smaller subsets in relation to the fluorescence" do refer to the spectral groups retrieved by the FluoroProbe?

Results

182 Correct punctuation: "the distribution of the SST, as well as the position of the river plumes".

Figure 5 (186) It seems the names of the eddies are duplicated in panels.

Figure 7 (226) Please, indicate which are the units for fluorescence, even if they are arbitrary units.

Figure 8 (230) Why values of total and groups of phytoplankton are not given in chlorophyll if the output of FluoroProbe is equivalent chlorophyll (95)? Maybe explaining the

FluoroProbe technique with more detail would help with the interpretation of the data, or at least including some references about the technique.

246 Figure 8 shows depth profile not surface fluorescence, maybe the text should read: "From satellite imagery and continuously recorded surface salinity and fluorescence data (Figure 4 and 7)".

Discussion

325 I don't think this sentence is correct. Which varies depending on the position in the water column could be which physical driver affects most the occurrence or distribution of phytoplankton, but not the interplay between physics and phytoplankton in general.

333 The authors seem to insist throughout the manuscript on the role of salinity/freshwater as one of the main drivers of the distribution of phytoplankton above the picnocline, which is more likely an effect of nutrient-availability (river discharge related). I would suggest the authors to take care of these kind of sentences that relate so directly salinity and phyto distribution.

339-348 This paragraph seems methods to me, not results. Maybe could be useful to have this paragraph in the methods section where the filtering technique is introduced to help explain its relevance (160), which is not very clear (see below).

350 I don't quite understand the point of this filtering technique. If I understood correctly with each iteration only the larger values are selected, and regarding chlorophyll this eventually considers only the large values in the DCM. But, with larger values correlation coefficients are also larger, not necessary meaning a higher correlation among data, so I am not sure that correlation coefficients between iterations are comparable. Also, with each iteration sample size, range and probably also variability are smaller which influences the comparability of correlation coefficients among iterations. I would suggest the authors to clarify the relevance of this statistical analysis.

353 "The strong negative correlation points suggest that in general brown algae are

highly conditioned by the salinity range". Conditioned by the salinity range in which sense?

372 Data presented are not of phytoplankton concentration.

403 The variable fluorescence to chlorophyll ratios could amplify or decrease the signal depending on if the fluorescence comes from accessory photosynthetic pigments (that increase relative to chlorophyll with depth) or from accessory photoprotective pigments (that decrease relative to chlorophyll with depth).

409 "The latter (dinoflagellates) can easily regulate their optimum depth by altering their swimming behaviour." Not sure about that, dinoflagellates can swim but not at the spatial scale necessary to change their position in the water column, working against turbulence, mixing and so on. If I am wrong, the authors should include some reference for this statement.

427 Possible references for fluorescence to chlorophyll ratios and for fluorescence fingerprint variable within groups and within populations: Estrada, Marrasé and Salat. In vivo fluorescence/chlorophyll a ratio as an ecological indicator in oceanography. Sci. Mar. (1996) 60(1) : 317-325. Kruskopf and Flynn. Chlorophyll content and fluorescence responses cannot be used to gauge reliably phytoplankton biomass, nutrient status or growth rate. New Phytologist (2006) 169: 525–536.

429 "In any case, vorticity creates a dynamical niche that plays a major role shaping the phytoplankton community". I find this is a too ambitious sentence, the "shape" of the phytoplankton community is not fully addressed in the manuscript and hence the major role of these vorticity-created niches has not been really evaluated.

435 This last paragraph is a mix of many concepts, phytoplankton functional types, biogeochemical models, harmful algae, fisheries. . . I would suggest to reorganize it and focus more clearly on the aims and findings of the manuscript.

Conclusions

447 ". . . joint analysis of remote and operational together with discrete data. . ." is confusing. Maybe repeat data after remote and operational.