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Comment

Interactive comment on “Autotrophic and heterotrophic metabolism of microbial planktonic communities in an oligotrophic coastal marine ecosystem: seasonal dynamics and episodic events” by O. Bonilla-Findji et al.

Anonymous Referee #3

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This manuscript presents seasonal changes in trophic balance (i.e., autotrophy versus heterotrophy) in the Bay of Villefranche. Although trophic balance is very important, data are still few for the coastal waters, especially for its temporal variation. The data in this manuscript contains important episodic events, e.g., forest fire, local upwelling and wet deposition of Sahara dust. Thus, I highly evaluate the data and support the publication after revision. I give many suggestions, but I think all of them are easy to be revised or considered.

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General comments

1. Purpose of this study is not clearly presented.
2. Threshold GPP is given as $2.8 \mu\text{mol } O_2 \text{ l}^{-1} \text{ d}^{-1}$ (P2042, L19), but it should be a mistake. Substitute 1 for GPP:R in the equation (P3042, L17), the obtained GPP, that is threshold GPP, is 1.12. The leaner regression line in Fig. 7 also shows that threshold GPP should be around 1 (i.e., $\log \text{GPP} \approx 0$) not 2.8 (i.e., $\log \text{GPP} = 0.45$). I strongly recommend to check the calculation again, because the estimate of threshold GPP should affect your conclusion.
3. What is “Total DOC consumption”? Is it BCD or DOC consumption by all biota? For the latter case, how did you measure it? Community respiration (R) is not total DOC consumption. State the meaning clearly. Anyway, BCD is only given in text (P2043, L29-31), but I suggest to show it in figure, considering its importance.

Specific comments

P2035, L19: What is “these processes”?

P2036, L13-14: How often did you take the seawater samples for routine analyses?

L20: Add “Net community production” before NCP and put NCP in brackets. Replace “CR” by “R”, because you designated community production as “R” in P2035.

P2037, L6: “...due to the low particle concentration” How much is the contribution of particulate organic carbon to TOC in general?

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P2038, L10-13: Prefiltration may change bacterial community structure and their activities. How much is the recovery of bacteria in the filtrate? And I suggest to describe the possible effects of prefiltration on the results in Discussion.

P2039, L5-6: “Bacterial carbon demand (BCD) was calculated as $BP + BR$ ” Give the assumption about bacterial respiration quotient.

P2040, L9: “The summer period of 2003 was characterized by a high frequency of forest fires. . .” State the mounts when forest fire was most frequently occurred.

L23-24: I think “ μM ” should be “ $\mu\text{mol } m^{-2}$ ” for time and depth integrated value.

P2041, L22-24: I think “ $\mu\text{mol } O_2 \text{ l}^{-1} \text{ d}^{-1}$ ” should be “ $\mu\text{mol } O_2 \text{ m}^{-2}$ ” for time and depth integrated value.

p2042, L2: “. . . was generally lower at the deeper stations” I suppose “station” should be “depths”.

L14: If you really calculate the volumetric ratio for GPP:R, please state the unit in Fig. 7.

L15: Figure 7b should be Fig. 7a.

L16: Replace “GRR” by “GPP”.

L17: Replace “ R_2 ” by “ R^2 ”. If you show R^2 , you should show a linear regression model (i.e., regression equation between $\log \text{GPP:R}$ and $\log \text{GPP}$) not a power equation.

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L20: How much is the average measured GPP?

L23: Add “Fig. 8a” at the end of the first sentence. “Overall, the lowest abundance occurred in winter, ...” I think the lowest BA was obtained not in winter but in Sep-Oct.

L25-27: “In February 2004, ...associated with heavy rains”. I suggest to move this sentence before the second sentence in P2041, L6.

P2043, L2-3: “Low rates were measured in autumn and winter, i.e. during the downwelling and forest fire period ...” I think forest fire period is Jul-Aug and it is not autumn or winter.

L6-7: “In July-August, the depth-integrated value was ca. 60% higher than in June...” Because the ratio of (BP in Jul-Aug):(BP in Jun) is less than 1 (Fig. 4), I think “higher” should be mistake.

L11-13: Give the assumption about photosynthetic quotient for the calculation of BP:GPP ratio.

L21-22: “No consistent effects were found following dust deposition event” What is your hypothesis about the relationship between dust deposition and BR?

P2044, L5: “co-variations were considered with correlation coefficients larger than 0.5” I think the number of data set is different among parameters. Why did you choose constant R for all the test of significance?

L7: “Positive correlations were found among Chl a concentrations, particle concentration and bacterial abundance” Because particle concentration didn’t collate to

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bacterial abundance, I suggest to revise this sentence.

L10: Replace “GGP” by “GPP”.

L13: “. . .to access GPP, CR, BR and BR”. I think either of two “BR” should be “BP” or “BA”.

L16-17: “However, less problems should be expected, when data are used in a comparative way as in this study”. Why can you say that? It is appeared that community composition varies among season and it affects the estimates of all biological rates given in this study.

P2045, L4-5: “total DOC consumption exceeded production rates” Which figure (or result) shows it?

L9-12: “During the autotrophic period. . .with R remaining stable compared to strong increases observed in GPP. . .changes in primary production were mainly driving the GPP:R ratio” Ratio of GPP:R was relatively constant during the autotrophic period (Fig. 7a). Do the changes in primary production really relate to the variation in GPP:R ratio?

L14-21: What do you suggest by comparing threshold GPP among the studies?

P2046, L11: When is “the second part of the study period”?

P2048, L5-6: “. . .forest fires contains inorganic nutrient. . .” I think fire doesn't contain nutrients but ash contains them.

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L14-15: "...although the forest fires should have supplied additional organic carbon (e.g. in the form of black carbon)..." To my knowledge, black carbon is not organic carbon, and, at least, it doesn't contribute to your DOC result. I suggest to delete this part.

L22-23: "...some organic P has likely imported by atmospheric deposition originating from forest fires" Cite the reference.

P2048, L14-15: "Such an import is likely too small to be detectable against background values." But the previous studies could detect the increase in SRP or DOC. State the difference between your study and the previous ones.

L17-19: "...nutrients are regenerated in February." Of course, regeneration is occurred though the year, but its degree should be temporally varied. Which is more effective for nutrients input in February 2004, regeneration or water mixing?

L21-23: "Bacterial abundance and production were ... higher than at the next sampling, when the phytoplankton bloom had already started." Because BA and BP usually increase with progress of primary production, which is more significant for stimulation of bacteria in February 2004, phytoplankton bloom or wet deposition? I know this is a difficult question, but I think the time-lag cannot fully support your idea.

Table and Figures

Table 1: "r" should be absolute value of r. But I suggest to reconsider the r values for test of significance (see above).

Fig. 1: Unit of y-axis in Fig. 1a should be " $\mu\text{mol photons } m^{-2} s^{-1}$ ". I suggest to change the unit of y-axis in Fig. 1b from "knots" to "m s⁻¹", because the unit used in

text is “m s⁻¹”. Add year in ticks of x-axis and wind direction in figure legend.

Fig 2. I ask to show the periods of upwelling, forest fire and wet deposition of Sahara by arrows for Figs 2, 6 and 8. I know it is a hard work, but it must be convenient for your potential readers. Put the unit in bracket for title of Fig. 2a and add (T) after “Temperature” in Figure legend of Fig. 2a. For the unit of Fig 2d, “ $\mu\text{mol C L}^{-1}$ ” is better than “ μM ”, considering the unit used for inorganic nutrients.

Fig. 3: The values for y-axis present the frequency of forest fire, but time-scale is not shown. I strongly suggest to show the number (or area) of forest fire occurred in Jul-Aug only. Add the definition of large fires in Figure legend.

Fig. 4: Add the definition of “stimulation” in Figure legend and show the actual period (Jul-Aug, 2003?) after “forest fire period”.

Fig. 5: Units of particle and bacterial abundance should be better to replaced by “particles ml^{-1} ” and “cells ml^{-1} ”, respectively. Add the actual period of Sahara dust event in Figure legend. I suggest to use the ticks of 0, 10, 20, 30 for y-axis, because they are the actual sampling depths.

Fig. 7: Add the explanation of the solid line in Figure legend.

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