Authors corresponding reply to the Reviewer's comments.

Referee #1:

Ding et al look at the dissolved organic carbon (DOC), dissolved inorganic carbon (DIC), D14C-DIC and hydrographic (T/S/σ) values to assess whether DOC distributions at the shelf-edge and shelf-slope regions of the East China Sea (ECS) are more affected by hydrodynamic processes (mixing of Kuroshio and Oyashio currents) or biological processes. They find that DOC in the ECS largely reflects mixing as opposed to biological processes, and that DOC oxidation only accounted for 18% of the oxygen consumption, thus implying that POC plays an important role in maintaining the biological pump as opposed to DOC. While I find the study to be simple and straightforward and potentially suitable for publication, it requires some substantial revisions.

R: We thank the positive summary of the Referee #1 on the manuscript. The following are our responses addressed to each comment made by Referee #1.

1) First of all, the authors suggest that since DOC and temperature correlate, that mixing must play a major role in the DOC distributions. While I find their reasoning to be completely valid here, they don't counter their argument by showing that DOC does not correlate with microbial processes. Are there bacterial abundance (BA) data from those seven stations? Do the BA correlate with DOC? If they don't, that will strengthen their argument that POC would be what sustains the microbial communities in that region.

R: Yes, we found the overall correlation of DOC concentrations and water temperature in the studied region. We agree with the Reviewer that this correlation should be applied only to DOC below the euphotic zone in the deep water. When DOC is produced in the surface water, microbial degradation is the major process causes the rapid decrease of DOC with depth. Our data as plotted in Figure 3 clearly show this. In the deep water, bacterial activities, of course, still play important roles to regulate the distribution of DOC, but ^{14}C measurements of DOC have shown that the DOC in the deep ocean (>1000 m) are highly refractory with ^{14}C ages of 6000 years in the N Pacific and 4000 years in the N Atlantic. Therefore, DOC in the deep ocean, like DIC, can be treated as conservative. We added more discussion to clarify this.

2) Secondly, the authors discuss the DIC and $\Delta^{14}C$-DIC values from that region, but never report their values in the Results. The Results section only includes hydrographic data and

DOC. If the authors are reporting these original data to support that DOC is distinct in water masses, these data should be reported in the results and discussed in greater detail. AOU should be reported in the results as well.

R: In the revised MS, we provided the DIC and Δ^{14}C-DIC data and added the vertical profiles of DIC and Δ^{14}C-DIC in the new Figure 5. We have discussed these results in Section 3.3 Concentrations and radiocarbon distribution of DIC in L 238-255.

Both Referees have concerns about the discussion of DOC vs. AOU. Since dissolved oxygen concentrations were only measured for some stations in the ECS, not in KE. We feel that there are no sufficient data set to discuss the correlation between DOC and AOU and to better response to the referee's questions. We therefore deleted the whole section on AOU.

3) Thirdly, the data reported here are limited, and these data are from either the shelfedge, or near the KE (as seen in Fig. 1); there are no data in between these two extremes. As the authors show that DOC correlates with temperature, even though there are no DOC data, perhaps there are some publicly available temperature data along the Kuroshio current that the authors can use to support their claims.

R: This is a very good comment. We plotted DOC vs. temperature for four stations selected from the CLIVAR 2004 cruise Line P02 as Figure S2 as supporting evidence for our data. The plots showed a very strong linear relationship between DOC and T (r^2 = 0.95, p<0.001) for the four stations mainly because these four stations were in a same water mass and much stable hydrodynamic region south of the Kuroshio Extension.

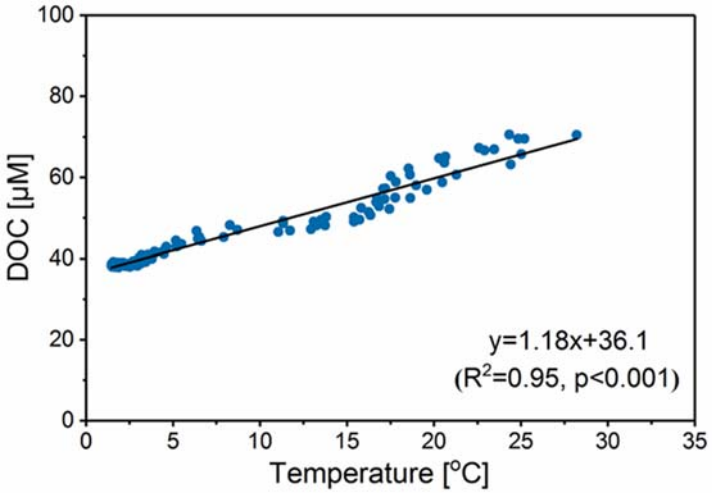

Figure S2. Correlation of DOC concentrations with water temperature for four stations selected from the CLIVAR 2004 cruise Line P02. The hydrologic and DOC data are from http://cdiac. ornl.gov/ oceans/ woce_p02. html.

4) In addition, Figures 5 and 8 look nice initially, but at a closer look, they are a bit misleading, as the data are quite spread out (and the data in the figures don't include all of the seven shelf stations and eight deep stations shown in Figure 1). Also, why is density listed as the conserved variable in figure 5, yet salinity is in figure 8? These two figures should be consistent. With those variables in mind, if the authors were to find more hydrographic data in the region to support the figures, that would be helpful (at least to show that the spreading of the data in the figures is a valid assumption). In addition, the x-axis on both of these figures is latitude, but the stations that are reported in each of these figures are not linearly spaced. I suggest at the very least putting a map with the section outlined in each figure to orient the reader.

R: In the old Figure 5a now Figure 7a, we have added the density variations of another two stations near the shelf-edge and slope regions in the ECS from a summer cruise in July 2011, in order to support the spread of the data in our results. In the old Figure 8a now Figure 9a, we have chosen the salinity as the conserved variable instead of density. The newly formed NPIW is characterized by a salinity minimum zone in the density range of 26.6–27.4 due to the along isopycnal mixing between the Kuroshio and Oyashio waters in the mixed region, and then the new NPIW is transported eastward by the KE as a low salinity tongue. The transactional distribution of salinity in Figure 9a could reveal the intrusion of fresh Oyashio water better than the density distribution in the KE region. Besides, we have also added the salinity from another five stations along the 35ºN transection in the NP to support our results. These data are downloaded from the Pacific Data Source in https://www.nodc.noaa.gov/ocads/. Also, as suggested by the Reviewer, we have put a location map in each new figure to illustrate the stations along the latitude transection in the ECS and KE regions (now Figures 7e and 9e).

5) Finally, there are some writing and style aspects of the paper that need to be improved. Several figure axes are miniscule and impossible to make out (see specific comments). In addition, the written English for the manuscript should be improved. There are quite a few grammar and wording issues that should be addressed. I pointed out some of them, but the authors would do well to send their manuscript to a proofreading service.

R: We feel sorry for this because we didn't send the manuscript for professional English proofreading and editing the first time. We will certainly do for the revised MS before we resubmit.

Specific comments:

6) Line 32: Suggest rephrasing sentence for clarification: "carried by the Kuroshio and Oyashio western boundary currents…"

R: Yes, we have rephrased this sentence as "carried by the Kuroshio and Oyashio, the two dominant western boundary currents in the region"

7) Line 41: "compounds" is not entirely correct because that is not considering the structural isomers…there could be more actual compounds than 20,000. Please replace "compounds" with "molecular formulae".

R: Replaced "compounds" with "molecular formulae".

8) Line 43: English: "plays", not "play"

R: Yes, corrected.

9) Line 65: English: replace "about a" with "there is a" and remove "was seen".

R: Yes, corrected as suggested.

10) Line 71: replace "such as" with "from"

R: Yes, corrected as suggested.

11) Line 75: add "the" before "Kuroshio".

R: We added "the" before "Kuroshio".

12) Lines 92-94: English: Consider correcting to: "DOC observations on WOCE (World Ocean Circulation Experiment) and CLIVAR cruises were collected at Line P02 stations along a 30 ^{o}N latitudinal transect, yet the distribution of DOC near the KE was not investigated during these cruises."

R: We have changed this sentence to "DOC observations on WOCE (World Ocean Circulation Experiment) and CLIVAR cruises have been collected at Line P02 stations along a 30 ^{o}N latitudinal transect, yet the distribution of DOC near the KE was not investigated during these cruises".

13) Line 110: Needs clarification: "it is affected": What is affected? The DOC? The currents? Please clarify.

R: In the revised MS, we have clarified this. The hydrographic characteristics and oceanic

processes are affected largely by the northward-flowing Kuroshio Current which impinges on the shelf break and a branch that enters the ECS.

14) Line 117: Remove "which".

R: Yes, removed.

15) Line 152: replace "Dr. Hansell" with "Hansell Biogeochemistry Laboratory"

R：Yes, we replaced "Dr. Hansell" with "Hansell Biogeochemistry Laboratory".

16) Line 185: Replace "were" with "are"

R：Yes, replace.

17) Line 188: spell out the number 7

R：We have replaced "7" with "seven".

18) Line 222: Significantly? Are they statistically lower? Otherwise please avoid using that word.

R：We have replaced "significantly" with "visibly".

19) Line 226: Where are the results for the DIC and D14C-DIC data?

R：See the comment earlier, we have added the vertical profiles of DIC and Δ^{14}C-DIC in the new Figure 5, and provided the results in Section 3.3 Concentrations and radiocarbon distribution of DIC in L 238-255.

20) Line 233: yes DOC has a good relationship with temperature, but does it also have a relationship with bacterial abundance? This seems like a pretty definitive statement, so at least provide some evidence that DOC does not correlate with a microbial parameter.

R：Unfortunately, the bacterial abundance was not measured for the studies. However, we found that DOC was not correlated with dissolve organic nitrogen (DON) for the stations. We believe that DON is a sensitive microbial parameter than DOC.

21) Line 290: Remove "apparent".

R：As responded to the earlier comment, we deleted the whole section on AOU including this

sentence.

22) Line 292: "statistically significant", not "significantly statistical"

R：Deleted this sentence which is included in the AOU section.

23) Line 293: Of course AOU and temperature have a high correlation; the temperature of water plays a role in the solubility of dissolved oxygen. Please advise and adjust this statement.

R：As responded for the last two comments, we deleted the whole section on AOU in the revised MS.

24) Line 374: How is ΔDOC calculated? There is no mention of how the authors determine a conserved DOC? Please clarify.

R：We referred the conservative DOC (DOC^0) as the concentrations of DOC derived from the two water masses mixing model as expressed in L 317.

ΔDOC can be calculated from the difference between the measured and conservative DOC concentrations, as clarified in (measured DOC－DOC^0) in the revised MS L 319.

25) Line 404: Again, use of "significant".

R：Yes, corrected.

Figures

26) Figure 1: The font on the z-axis is especially tiny and unreadable. The fonts on the x and y axis should probably be larger as well.

R：We have adjusted the font in the figure.

27) Figure 2: Have the authors considered putting these figures in T/S space, as opposed to vs. depth? What is their reasoning behind using depth? With T/S space, they can distinguish the different water masses that are present in the system (and they would need less subplots).

R：As suggested, we have redrawn the T-S diagrams in new Figure 2 and put the hydrographic profiles in the attachment as Figure S1 for reference. We have also modified the Section 3.1 according to T-S diagram of the new Figure 2.

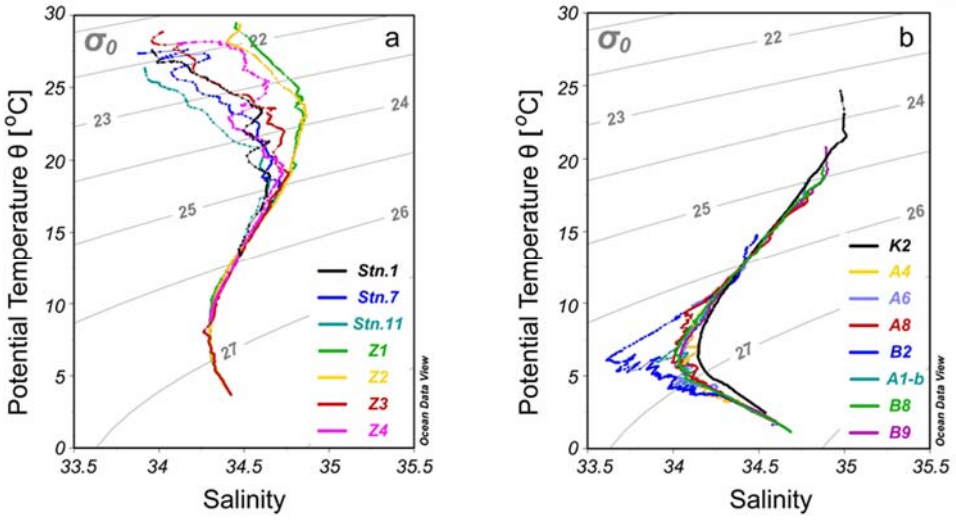

Figure 2. Potential temperature versus salinity plots (T-S diagram) for the sampling stations. (a) Seven shelf-edge to slope stations in the ECS and (b) eight deep stations in the KE of northwestern NP.

28) Figure 7. The font is tiny and impossible to see.

R：We have enlarged the font in the old Figure 7 now Figure 8.

29) Figure 8: This is intrusion is interesting and the data look nice, but it appears to be only five stations spread out across 8 degrees of latitude. I understand that sampling is limited here, but the colors are really spread out over a large range, which can be misleading. How do we know that this is truly what the hydrography looks like there? As salinity is shown there, there must be some other datasets around with more salinity in the region. I suggest that the authors expand their data for salinity at least, to show a more complete picture of the currents in the region. The same general idea goes for Figure 5.

R：We agree with the Reviewer's comments for the old Figures 5 and 8. As responded for the earlier comment, for the old Figure 8a now Figure 9a, we added more salinity data from five other stations along the 35 °N transection to support the spread of the salinity variations. Again, the salinity data are downloaded from the Pacific Data Source at https://www.nodc.noaa.gov/ocads/. The same expand changes for density in the ECS were also made for the old Figure 5a, now Figure 7a as responded above for comment 4.

30) Figure 9: The x-axis range is odd. Why not zoom in to better reflect the regression?

R：We have zoomed in the X-axis by using "$(mmol/kg)^{-1}$" as the unit for $[DIC]^{-1}$ instead of "$(\mu mol/kg)^{-1}$".