Please find the replies to the questions/concerns of the reviewer. We have also modified colors of figures 5 and 6

This manuscript is generally well-written and interesting and gives a lot of information on the composition and state of estuaries in this region. The figures are good and insightful. I have a few outstanding questions/concerns, listed below. Once those have been addressed, I think this manuscript will be ready for publication. → Thanks for this evaluation.

One overarching comment I have has to do with vertical properties of the water column. All measurements are taken near the surface. Is there evidence to show that surface properties represent those throughout the water column? In other words, does hypoxia at 0.5 m also mean that there is hypoxia at the bottom? → This question was already addressed in the first review round. Additional infomations have been already added such as the fact that *the Charente estuary is a macrotidal estuary with an average depth of approximately 9 m around Rochefort. It is a partially mixed to well-mixed macrotidal estuary, with stratified conditions occurring at very high river discharge (Toublanc et al., 2016). The tides are semidiurnal with an average amplitude of 4.2 m, reaching up to 7 m during spring tides.* Information on the depth of the sites have been added: typically, the water column is between 1-2 at low tide to 8-10 at high tide. Considering the high tide currents and the limited depth, especiallay at low tide, there is no or limited stratification in such macrotidal estuary, especially in the upper section. Measurements are done in surface water, and not in depth, then one could consider that the surface values could be rather representative of DO. However at the bottom DO could be even lower (as bottom waters are isolated from the atmosphere and the occurrence of high SPM (several g / L) not only precludes primary production but also promotes consumption. A stratification would isolate even more the bottom waters. During some field works, we did vertical profiles that show deep DO to be always lower than surface DO.

- Line 35 – should temperature be included here? → Temperature was added although stricto sensus there were no specific temperature sensor, it is the optode (DO sensor) that measures DO and temperature.

- Lines 49 to 53 – I found this confusing to read. I suggest focusing it to discuss processes that add oxygen and processes that remove oxygen → I don't understand the comment as the lines from 49 to 51 detail processes that add DO (« or adsorbed » was suppresed to simplify the sentences). Then the lines 51 to 52 explains processes removing DO.

- Line 104 – What is a turbidity maximum zone (TMZ) and how is it defined? → The notion of TMZ is previously defined in the introduction from lines 70 to 78.

- Figure 1 – I suggest adding the catchment area to this figure → the water cathment area is now indicated, and also the extent of the study area and of the oxygen minimum zone.

- Lines 127 to 131 – The authors mention that there are 3 datasets but them didn't really specify the 3. Please clarify. → The 3 datasets are described in each sub-sections :

2.2.1 High-frequency summer monitoring of the Charente estuary
2.2.2. Longitudinal investigation of the Charente estuary
2.2.3 Low-frequency long-term monitoring
The details were already given in Table 1, « There are three datasets» is now added to the table caption

- Line 137 – Should temperature be included here? → Optode measures always dissolved oxygen + temperature whatever the supplier (HOBO, RBR, NKE..).

Also, what is the accuracy of the HOBO optode and conductivity sensor? And how does the error estimate of these sensors compare with the variability of the data?

The specification of the Hobo sensors are given on the Hobo web site https://www.onsetcomp.com/products/data-loggers/u26-001#specifications:

> DO measurement range 0 to 30 mg/L ± 0.2 mg/L up to 8 mg/L; ± 0.5 mg/L from 8 to 20 mg/L
>
> Temperature Measurement: -5 to 40°C ± 0.2°C

The range of values recorded in this work (LS and HF) is 1 to 10 mg L^{-1}, the sensor errors (0.2 at values < 8 mg L^{-1}) are negligible considering the range of variation.

The conductivity-salinity sensor has a measurement range from nearly 0 to 40, with a precision of 3%. The salinity range of the data acquired during the high-frequency and longitudinal survey is 1 to about 15), there is no problem of sensitivity of the conductivity /salinity sensor, even during a tidal cycle. It has to be said that conductivity/salinity (along with temperature) is one of the most reliably measured physical parameters, even at low levels of variation, which is not the case here.

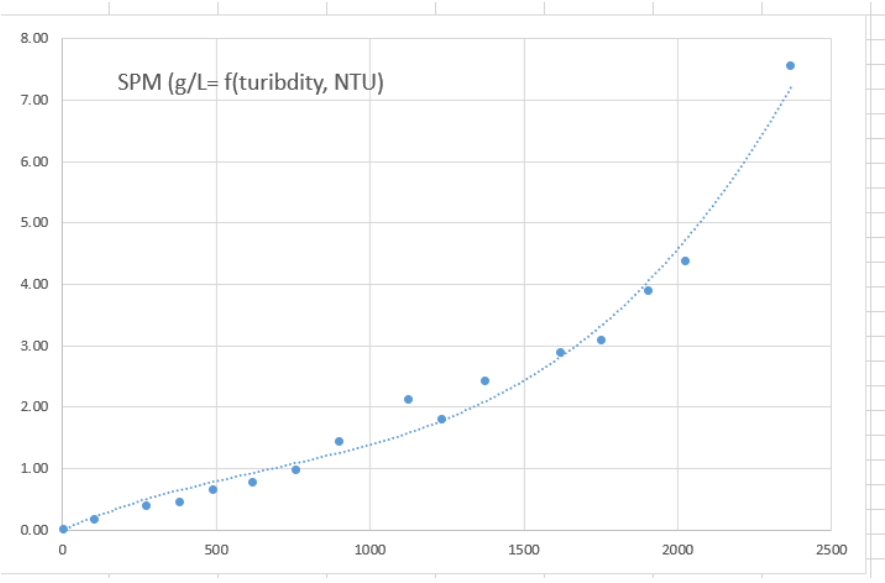
A sentence is added

The measured parameters are temperature (−-5 to +35°C; ± < 1%), conductivity/salinity (salinity range 0.1 -42; ± < 5%), turbidity (Turner Designs CYCLOPS-7; 0 - 3000 NTU; ± < 5%) and dissolved oxygen (0 - 20 mg L^{-1}; ±0.1 mg L^{-1})

- Lines 143 to 145 – Similar to above, what is the accuracy of the SAMBAT instrument? And how does it compare to the HOBO? → These informations are already provided along with the dataset at the link doi.org/10.17882/95886 provided in table 1. The sentence below is now added in the method section:

The measured parameters are temperature (−-5 to +35°C; ± < 1%), conductivity/salinity (salinity range 0.1 -42; ± < 5%), turbidity (Turner Designs CYCLOPS-7; 0 - 3000 NTU; ± < 5%) and dissolved oxygen (0 - 20 mg L^{-1}; ±0.1 mg L^{-1})

The Sambat accuracy is even better than those of Hobo sensors.



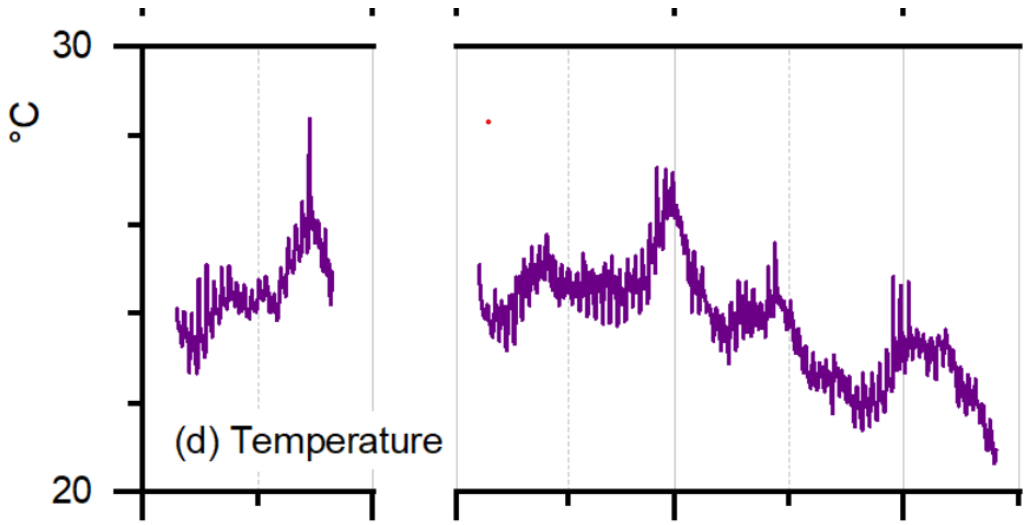
- Lines 145 to 146 – The conversion of turbidity from voltage to g/L is not trivial. Could the authors please show how this did this? Figures would be great so the reader can assess the accuracy of the

conversion. → The method did not indicate the the turbidity was in voltage, but in NTU. The specification of NKE Instrument is 0 - 3000 NTU. The sensor is selled with a calibration using formazine (3 points 10 – 100 – 1000 NTU). Above 1000 NTU the relationship between NTU and formazine (FNU) is no more linear. Anyway, turbidity (FNU or NTU) is not very informative. It is the reason for which a relationship is establised between NTU and SPM. It is done at the lab using different concentrations of SPM from the Charente estuary (SPM determined by classical gravimetric method). Below an example of a SPM-to-turbidity rating curve obtained on estuarine SPM. Such determinations are repeated to produce a mean relationship to convert NTU in SPM.

- Line 157 – I haven't heard about a longitudinal study before. Could you please add a description of how this is done? Because I am not familiar with this method, I struggled to interpret the results. → we are confused by this question because it is a formulation that has already been used in previous articles without raising any questions (see for example https://www.frontiersin.org/articles/10.3389/fmars.2019.00352/full). The Collins dictionary defines longitudinal as "A longitudinal line or structure goes from one end of an object to the other rather than across it from side to side". Applied to a river or estuary, this indicates a transect from one site (e.g. Soubise) to another (e.g. Tonnay-Charente) along the axis of the estuary. This is in contrast to a radial (which would have been made perpendicular to a site, across the width of the estuary).

Section 2.2.2 relative to the longitudinal investigation was modified in order to simplify the text.

- Line 198 – What is TMZ? Could you please define it again here so the readers don't have to dig through the methods section → TMZ is turbidity maximum zone and this feature of macrotidal estuary is explained in the introduciton (and not the method !) . The sentence «The TMZ is present at Rochefort at least from July to November » is replaced by « The turbidity maximum zone (TMZ), corresponding to an SPM concentration greater than 1 g L^{-1}, is present at Rochefort at least from July to November ». The threshold of 1 g L^{-1} is now indicated in the Figures 2, 3 and 4.



- Figure 4 – It is really interesting to me that temperature doesn't vary with tides yet temperature and salinity do. Do the authors have some explanation about why temperature doesn't vary with the tides? Or why there isn't day/night heating and cooling? → We are in a macrotidal estuary with a tidal range of over 3 metres and strong mid-tide currents. Line 100-101, it is indicated that "It is a partially mixed to well-mixed macrotidal estuary, with stratified conditions occurring at very high river discharge ". "The tides are semidiurnal" this high mixing produces a rather homogeneity on temperature. However, we are not agreeing the comment, temperature does not present as high variability than salinity (we are in an estuary), but there are short-term variabilities with tide. It is less obvious because the annual

range of temperature is large, however during a tide, the temperature difference could be of 1-2°C, even more during heat waves, for example in 2018 with an increase of more than 2°C (the figure is a zoom of 2018 and 209 of the figure 4

- Line 267 – Are the authors referring to Figure 4a here, not Figure 3? → indeed it is corrected

- Line 302 – I find this paragraph confusing. For example, I don't see Saint-Savinien data in Figures 5 or 6: → this refers to the previously described data at Saint-Savinien. "Fig.2d" is added and the sentences were modified to clarify the purpose.

- Line 313 – The authors state upstream but I think that they mean downstream (i.e. closer to the ocean)? → corrected

- Line 319 – What is the proof that the waters around Rochefort are always surrounded by oxygen-poor water? → the different dataset show that DO is also low at the two stations (Tonnay-Charente, Matrou) that surrounding this site (Rochefort) (Figure 5 and 6).

- Section 3.3 – I found this section very difficult to read, possibly because I didn't understand how longitudinal distributions were calculated. Other questions I had in this section are:

o How was the OMZ defined? How deep is it? → it is not OMZ as in open ocean, it is similar to the turbidity maxim zone TMZ, ie the estuarine region where DO is low. To avoid confusion, it is changed to eOMZ (estuarine OMZ).

o I struggled to picture where on a map the low oxygen waters were. I suggest that the authors add a map to Figure 7 that shows the location and magnitude of the low oxygen waters. → indication of the study area and of the OMZ is added in the map in Figure 1.

o Lines 340 to 345 – This is very confusing and I couldn't figure out exactly where the high and low oxygen waters were. This is partly because I think the upstream and downstream labels may be wrong (or different from the way I think – in my mind, downstream means closer to the ocean and upstream means further away from the ocean) and also because talking about low oxygen water at L'Houmee is different than what I see in Figure 5. → this was checked, it is ok. This is precsied that low DO at L'Houmée are observed at low tide. Names of sites were added.

- Line 368 – Where does this 25 km extent come from? Again, showing these data on a map would help the reader picture the low oxygen zones → The position and distance of stations is also given in figure 7. An arrow was added to help the reader.

- Figure 8b – This figure reminds me of Figure 3f from Rosen et al (https://www.frontiersin.org/articles/10.3389/fmars.2022.1000041/full) – can a comparison be made? → THe two figures don't correspond to the same information, in Rosen et al, it corresponds to the hypoxia% in the upper 50 m, whereas figure 8 shows the number of hours per day during which DO is in specific ranges. The only possible adaptation is to calculate the % of the day hypoxia occurs. For clarity we had a figure, it provides the same pattern as the figure with the number of hours. The difference is the unit , % instead hour. We are not convinced that it is useful, but the figure is changed if it could help reader to understand.