In black : comments of RC1 / in blue reply of authors

when the answer is based on the text of the article, the lines corresponding to the quotation are indicated as follows: Lines xx and the text is underlined.

The manuscript is like many others reporting low oxygen conditions where not measured before. The results are not particularly new given that deoxygenation occurs more and more, either because of poor water quality (usually eutrophication) or more collection of data.
We agree that the development of hypoxia is not a new idea.
We disagree with RC1 assertion that

- *results are not particularly new* : the dataset is new: the data has never been published before.
- *deoxygenation occurs more and more* : It's true that hypoxia is increasing in coastal areas, as reported in review articles. But RC1 seems to overlook the situation in estuaries, where restoration has improved dissolved oxygen levels after situations of hypoxia or even anoxia,

The idea of a turbidity maximum is presented as an issue, but there are few data that link the turbidity maximum and low oxygen The purpose of th article is not to discuss the maximum turbidity zone (TMZ) in the Charente estuary, for which references are given. There are already articles on the link between deoxygenation and TMZ in macrotidal estuaries (some references are given in the introduction).
Otherwise, the usual water quality parameters are those important in the development of the low oxygen—warmer waters, sluggish circulation, organic matter decomposition, especially from dense algal blooms. Lines 70-71 : SPM limits light penetration and hence photosynthetic activity. There is no dense algal blooms in the Charente estuary

There are poor language choices, poor logic statements; several examples were pointed out. These poor choices of words generate many illogical statements and poor understanding of the important issues and their positioning in the eventual interpretation of the results. There needs to be a thorough revision of the entire manuscript to use proper English, punctuation: before publication in biogeosciences discussion, the manuscript is reviewed by the editor in charge. If necessary, the editor requests corrections. There have been no requests for English corrections. However, if there are any typographical errors, we apologise and will correct them in the revised version.
consistency in references cited in the text and in the list of references. There are 27 references in total, and one is missing. This is the article by Curran and Henderson (1988), which is cited on line 347. The complete reference is: Curran, J.C., and Henderdon A.R.: The oxygen requirements of a polluted estuary for the establishment of a migratory salmon, Salmo salar L., population, J. Fish Biol. 33, 63-69n 1988.

The various methods used were not necessarily the best for defining low oxygen conditions. The results are a mixture of many different studies, methods, frequency of measurements, and methods to measure duration of low oxygen. For example, probes were placed 0.5 m below the surface. This is not a reasonable method to detect low oxygen conditions through the water column. The resources of concern, migrating fish use different depths of the water column, and thus potentially disrupted at different levels. The aim of this study was to detect possible hypoxia in the Charente estuary, which is the Charente estuary is (lines 93-94) a small, shallow, macrotidal estuary with an average tidal range of 4.2 m, reaching up to 7 m during spring tides. We hadn't considered the implications of the high tidal range and shallow depth of the estuary. We thought this was implicit and will correct this in the revised version. During each tidal cycle, the water level changes by several metres, associated at mid-tide with strong currents that tend to mix the entire water column. At low tide, the water level is lower, which explains the sentence lines 137-139 in the case of macrotidal rivers such as the Charente, where the pontoons are not far from the shore, they tend to be grounded at low tide, especially during spring tides; this was the case at L'Houmée, Rochefort and Matrou. Few depth profiles have been established, showing only slight differences between surface and bottom.

The 'high' frequency data are gappy, which is acknowledged, but too many conclusions are expressed in general terms rather than sound evidence, especially based on near-surface water data. We have never written that high frequency data is inaccurate, if that's what RV1 means by gappy. On the contrary, the comparison of two dataset (low and high frequencies) shows line 277 that high-frequency monitoring is essential in macrotidal estuaries.

Now that the authors have used the data to make predictions into the future, the federal (or provincial) agencies should fund an adequate monitoring program for spring, summer, and early fall. Recommendations from this study could inform what the program would include. Strategically placed profiling sondes for dissolved oxygen, temperature, and salinity information through the water column in at least a portion of the estuary for a volume-placed inquiry, especially including the bottom (or near-bottom) water where dissolved oxygen conditions are assumed to be critically low. We thank the reviewer for finding the work useful in providing recommendations to help regional water authorities implement appropriate monitoring. This is effective from 2021: section 4 Concluding remarks, lines 405-407 contains this information. There is an instrumented site (Tonnay-Charente). The multiparameter probe (sondes ?) also includes a turbidity sensor ; the monitoring is annual. But, in a shallow macrotidal estuary such as the Charente, the challenge is to determine the extent of the hypoxic zone, which will require the installation of additional sites, at least during the summer, rather depth profiles.

Section 4. Concluding Remarks is a correct, concise and well-presented summary of the reasons for the study, the basic results, and the implications for the future. The bulk of the manuscript is not any of these modifiers. Given the general tone of the review, we can speculate on the meaning of the second sentence. But we don't understand the word "modifiers" (nor do any of the online translators).

Specific comments:
The comments from lines 30 to 43 concern the abstract,
L 30, “these” does not identify the antecedent. The two larger estuaries, or multiple ones (not yet identified) between them.
Lines 28-30: Multi-year, multi-site, high-frequency water quality surveys have shown that the Loire, and to a lesser extent the Gironde, suffer from summer hypoxia. These observations raised the question of the possible occurrence of hypoxia, particularly in one of these …. → The demonstrative determiner "these observations" refers to surveys.

L 31, the first oyster producing area [by aquaculture?] we're talking about production area, so yes, aquaculture. Lines 101-103: The Charente river discharges through the Charente estuary (Figure 1) into the Bay of Marennes-Oléron, the first oyster-producing area in France (Goulletquer and Heral, 1997) and a major nursery ground for juveniles of the Bay of Biscay sole population (Le Pape et al., 2003; Modéran et al., 2012).

L 31-33, assumes that the two other estuaries are compromised, but not yet established. We don't understand the comment. In the abstract it says lines 28-29 Multi-year, multi-site, high-frequency water quality surveys have shown that the Loire, and to a lesser extent the Gironde, suffer from summer hypoxia. Hypoxia events have already been measured in the other two estuaries: it is a fact. It is briefly developed and supported by references Lines 76-79 The spatio-temporal DO dynamics of the two large systems are well described by long-term, high-frequency and multi-sites measurements of water quality. While episodic summer hypoxia events have been recorded in the fluvial Gironde estuary, the Loire estuary experiences permanent summer hypoxia in its lower reaches (Lanoux et al., 2013; Schmidt et al., 2019).

L 41-42, the fisheries comment seems peripheral, without any other substantiating information, but rather a mention of oyster production. Perhaps a broader reference to ‘aquatic fishery resources.’ In the Charente estuary, there is a real problem for migratory fish, especially during the downstream migration of larvae.

L 43, …Essential for the survival of aquatic animals and plants, oxygen levels… [plants generate oxygen and are not compromised by lower dissolved oxygen] We admit that the sentence is very synthetic, the allusion is to chemical oxygen demand for decomposition of aquatic plants. Plants produce but also consume dissolved oxygen. Anyway, plants could be suppressed

L 50, also from advection of adjacent higher oxygen waters. Advection could be an input, or not if the advected waters are depleted in DO, but it is not a production of DO. Dissolved oxygen comes from two natural processes: diffusion from the atmosphere and photosynthesis by aquatic plants.

L 52, suggest “other aerobic organisms” instead of “decomposing organisms” Are the organisms doing the decomposing, or are they decomposing themselves through organic respiration. The purpose is was to describe briefly the DO budget, and not to detail the processes, Line 52 Conversely, bacteria and

other decomposing organisms consume oxygen to break down organic matter. To stick to the broad general outlines, to stick to the broad general outlines “and other decomposing organisms” will be suppressed

L 54, oxygen saturation may also be used to determine autotrophy, respiration, and overall net production…Interesting but this is not but that's not the point of the sentence, which is simply an explanation of the term depletion: Dissolved oxygen depletion occurs when the measured dissolved oxygen concentration is below the theoretical saturation value

L 59 …long-term evolution… Geologic, millennial, decades, post-industrial period? In time with increased reactive N in the ecosystem? Generally speaking, for environmental issues, we're talking about the Anthropocene, when human activities have had a major impact on the environment since the late 18th century, as defined by Crutzen 2007. The timescales considered in this paper are the next few decades. its long-term evolution will be replaced by its evolution over several decades.

L 61, liquid and solid inputs from… Suggest “dissolved and particulate fluxes from…” the choice of words is a matter of discipline, the terms “liquid and solid inputs” are also used in estuaries and rivers

L63-55, long sentence with multiple ideas and no concise point The sentence lines 63-65 will be simplified to make it easier to understand

L 68-70 is not clear. This reviewer follows the meaning, but it is not well presented. It's a long sentence to describe tidal pumping, the use of which would have raised even more questions of RC1. We will consider to do two sentences to help readers.

L 70-74 recognizes the difference between organic and inorganic suspended matter. Both are contained in the term SPM. The mineral turbidity or what is often considered the suspended sediments can be confounded by organic particulates in the form of phytoplankton, living and senescent, that may affect ‘turbidity. we only briefly describe the well-know feature of turbidity maximum zone, and indeed several grammes per litre of dry sediments (whatever the C content) SPM limits light penetration and hence photosynthetic activity, and gas exchange with the atmosphere. This is not the purpose to go in details of particle nature.

L 82, south-west in this sentence, versus north-east earlier in the manuscript. Are these geographic descriptors relevant to Bay of Biscay or the eastern coast of France?
Line 26: The French coast facing the Bay of Biscay (north-east Atlantic) is characterised by the presence of small macrotidal and turbid estuaries → The Bay of Biscay is located in the north-eastern part of the Atlantic Ocean
Line 80 for the south-west France: the Charente estuary is located in the south-west France and flows in the Bay of Biscay
The eastern coast of France is the continental Europe

L 94-95, suggest …. The tidal influence reaches 50 km upstream of the mouth but not further because of a dam at Saint-Savinien, which is opened during spring tides …. The proposed sentence does not really reproduce the idea of the initial sentence. We are considering revising the sentence so that it can be understood by as many readers as possible

L 99, is the word “longitudinally” necessary? The meaning is obscure, here and elsewhere. A trajectory in an estuary or river can be longitudinal (along the axis) or radial (perpendicular to the axis). We have used this term in previous articles without causing any problems for the editor or reviewers. For example, see the published article cited in this manuscript : https://doi.org/10.3389/fmars.2019.00352

L 102, “Bay of Marennes-Oléron” should be identified in Fig. 1. Any geographic location in the text should be identified in Fig. 1. Bay of Marennes-Oléron will be added to Figure 1

L 104, suggest…..The coastal fringe is more populated (80 to 100 inhabitants km^{-2}) than the rural interior (40 to 60 inhabitants km^{-2}). The largest…. Here gain it is not exactly what we want to say, at least “densely” is missing in the suggestion.

L 108, words “low,” “good” for water quality, “all uses are satisfied on average…” need to be replaced with more appropriate descriptors. Descriptors are defined, first line 46-48 Dissolved oxygen is one of the key physico-chemical quality elements that the EU Water Framework Directive (WFD) requires to be considered in order to achieve “**good** ecological status” (Best et al., 2007).
Again in the sentence Line 108 The target low flow, defined as "the reference flow which allows good water status to be achieved and above which all uses are satisfied on average 8 years out of 10", is 15 m3 s-1. Again it refers to good status required by the EU. A statement on DO levels regarding such words is detailed section 2.2.4 Line 170 to 175. We will consider to place this section earlier in the manuscript.

AT THIS POINT, I WILL NOT MAKE ANY MORE WORDING SUGGESTIONS, UNLESS I DO NOT UNDERSTAND THE MEANING. Could rc1's insistence on the wording be seen as abusive comments?

L 150+ future recommendation, if a probe is available with sufficient cable, a vertical profile would be advantageous compared to 0.5 m below the surface for defining low oxygen conditions. Interesting recommendation but technically and financially complicated to implement in a macrotidal estuary. In addition, at low tide the depth of the water column at most sites is less than 1-2 meter

L 159, define concentration below which the water is considered “hypoxic.” From Fig. 1 appears to be 2 mg/l, which usually equates to 30% saturation, depending on the temperature and salinity. Figure 1 is a map, are we to understand that RC1 is referring to Fig. 2. We specify that the same colour is used for the figure 3 and 4 for the limit of 2 mg/L. It will be specified in the figure caption. But what a surprising question from a colleague who agreed to review an article on hypoxia. We use the commonly used threshold for hypoxia, ie a oxygen concentrations ≤2 mg/L (=63 µmol /L or), see for example Diaz and Rosenberg (2008). It is in fact written in the text line 56 even to hypoxia (< 2 mg L-1) or anoxia (0 mg L-1), or suggested line 248 The minimum DO reached at the beginning of August 2018 is 2.5 mg L-1, just above the hypoxic level.

L 160-165, long sentences could be shortened and more concise. Again, troubles with long sentences, we'll see how we can cut it so that most people can read it.

L 194, is it is difficult to understand a 82% saturation coupled with a 2.2 mg/L dissolved oxygen concentration. This is of course a typing error for which we would apologize, but it will be corrected. It is 8.2%
L 200, are the oxygen values representative of 0.5 m below the surface? Yes

I did not comment on the remainder of the manuscript but did read it. The comments would have continued as before. Just the main results; more concise; too many unnecessary details, unquantifiable terms. E.g., “rather similar” used twice to describe types of data, yes indeed Line 220 The seasonal pattern of DO variability is rather similar between the stations How would the reviewer qualify the differences, using statistics would unnecessarily complicate the discussion for data that are actually very similar? Rather could be suppressed but is it so dramatic ?
“rather dated.” Line 365 is clear that the number of studies is limited and rather dated : The term "dated" does not apply to the data, but is used to describe the references cited in the review article d’Arevalo et al (2023), pointed out the need of studies.

The text will be carefully checked to make it more concise where necessary. However, most of the comments made in RC1 will lead to additions to explain the concepts mentioned in some of the long sentences. For example, it seems useful to explain the hydrodynamic implications of a shallow macrotidal estuary, and the definition of tidal pumping of hypoxia