

Response to Editor comment

Comment 1:

The two reviewers have a very positive evaluation of the dataset presented in the article submitted by Matsuzaki et al., which is a valuable reanalysis dataset of the coupled physical and biogeochemical conditions in Ise Bay, Japan. The interest in this dataset extends beyond the scientific community and could also be very useful for stakeholders, not only for the dataset itself, but also for the quality control description.

I understand the comment from Referee #1 who requested the use of SI units for dissolved oxygen (DO), but I agree with the authors' comments that point out the more common use of milligrams per litre (mg/L) in coastal and estuarine waters, especially by practitioners. I agree with the decision to use mg/L in this specific article (I am doing the same). However, I would suggest that the authors provide the DO concentration range in SI units in the captions of figures 7, 11, 12, 15, 16 and 17.

Response:

Thank you very much for your positive evaluation of our dataset and manuscript. We are grateful for your encouraging comments regarding the scientific value of the Ise Bay Reanalysis (IBRA) dataset, its potential usefulness for stakeholders, and the importance of the quality control description. We appreciate your recognition of these aspects of our work. Regarding your suggestion on the use of SI units for dissolved oxygen (DO), in the revised manuscript, we have added the following statement to the captions of Figures 4, 7, 8, 11, 12, 15, 16, and 17, which show DO distributions:

"For SI-unit conversion, $1 \text{ mg O}_2 \text{ L}^{-1} = 0.03125 \text{ mol m}^{-3}$."

Because each figure contains multiple panels with different DO concentration ranges, we considered that providing a common conversion factor would be clearer and more concise than listing the corresponding SI-unit range for each panel individually.

Thank you again for your valuable suggestion and supportive comments.

Response to Referee #1

We would like to thank the referee for the positive evaluation of our dataset and for the constructive comments. We appreciate the time and effort devoted to reviewing our manuscript. All comments have been carefully considered, and the manuscript has been revised accordingly.

Comment 1:

The number of figures is rather large. Maybe some could be moved to the appendix.

Response:

Thank you for this valuable suggestion. We understand the referee's concern regarding the relatively large number of figures. However, we believe that the current set of figures is necessary to comprehensively demonstrate the accuracy, validation results, and uncertainties of the reanalysis dataset. Moving key figures to the appendix may reduce the accessibility of these important validation results and make it more difficult for readers to evaluate the dataset quality. Therefore, we have retained the figures in the main text.

Comment 2:

Date format: Please use it like 1 January 2011.

Response:

Thank you for pointing this out. We agree with this suggestion and have revised the date format throughout the manuscript to follow the style "1 January 2011".

Comment 3:

Dissolved oxygen data are presented in mg/L. This concentration is not in SI units. In oceanography often the units $\mu\text{mol/kg}$ are used. For shallow continental shelf regions, one could also use $\mu\text{mol/L}$. I leave it to the editor to decide which units are appropriate.

Response:

Thank you for this valuable comment. We recognize that units such as $\mu\text{mol/kg}$ and $\mu\text{mol/L}$ are commonly used for dissolved oxygen concentrations in oceanographic studies. However, the primary target users of this dataset are researchers and practitioners in civil engineering and coastal environmental management, where dissolved oxygen concentrations are conventionally expressed in mg/L. To ensure consistency with the conventions of the intended user community and related studies in this field, we would prefer to retain the unit mg/L in the manuscript, while the publicly available dataset is provided in mol m^{-3} . We have clarified this rationale in the revised manuscript. Additionally, based on feedback from the editor, we have added the conversion values to SI units to the captions of the DO figures.

Comment 4

Title: I think not many readers will be familiar with EcoPARI. Maybe it is better to remove this from the title and choose another description.

Response:

Thank you for this valuable suggestion. We agree that the term "EcoPARI" may not be familiar to many readers and could reduce the accessibility of the title. Therefore, we have removed "EcoPARI" from the title and revised the title to provide a more descriptive and accessible description of the dataset.

We would like to revise the title as follows and will follow the editor's recommendation regarding the proposed change:

Ise Bay Reanalysis (IBRA): A 12-Year Ecological Hydrodynamic Reanalysis Dataset for Ise Bay, Japan

We appreciate this helpful comment, which has improved the clarity and accessibility of the manuscript for a broader readership.

Comment 5

L35 "highly enclosed" is strange. It is either "enclosed" or "not enclosed", or for that sake, "almost enclosed".

Response:

Thank you for this comment. We agree that the expression "highly enclosed" may be ambiguous and is not the most appropriate terminology for describing the target coastal systems. We have revised the manuscript by replacing "highly enclosed coastal systems" with the more commonly used term "semi-enclosed coastal systems" throughout the manuscript.

Comment 6

L40 field, not area

Response:

Thank you for pointing this out. We have replaced "area" with "field" in the revised manuscript.

Comment 7

L41 ... produced a global ...

Response:

Thank you for pointing this out. We have added the article "a" before "global" in the revised manuscript.

Comment 8

L52, L59 same as in L35 above

Response:

Thank you for this comment. We have replaced these expressions with "semi-enclosed coastal systems" throughout the manuscript for consistency with the terminology used in the revised version.

Comment 9

L69-71 "IBRA was developed as part of a research project funded by the Environmental Research and Technology Development Fund of the Environmental Restoration and Conservation Agency (JPMEERF20221R01), Ministry of the Environment, Japan." This sentence should be moved to the acknowledgments.

Response:

Thank you for this suggestion. Since this information is already provided in the funding section, we have removed the sentence from the main text to avoid redundancy.

Comment 10

L75 variables, not parameters

Response:

Thank you for pointing this out. We have replaced "parameters" with "variables" in the revised manuscript.

Comment 11

L75 This sentence should start with "First", as second and thirds appear further down

Response:

Thank you for pointing this out. We have added "First" at the beginning of the sentence to maintain consistency with the subsequent use of "Second" and "Third" in the manuscript.

Comment 12

L81 Why is the reference underscored?

Response:

Thank you for pointing this out. The unintended underlining has been removed from the reference.

Comment 13

L75-87 I think this part would fit better in the Methods section

Response:

Thank you for this suggestion. We agree that the detailed descriptions are more appropriate for the Methods section. Therefore, we have moved the detailed explanations to Section 2 and retained only a brief summary of the three key features of the IBRA dataset in the Introduction.

Comment 14

Figure 1: The figure as it is now is quite useful. However, it would be helpful to have another panel in Figure 1 with the larger region and the place of the bay along the Pacific coastline.

Response:

Thank you for this helpful suggestion. We agree that providing a larger-scale map would improve the geographical context of the study area for international readers. Therefore, we have added an additional panel to Figure 1 showing the location of Ise Bay along the Pacific coast of Japan.

Comment 15

L141 are, not have been

Response:

Thank you for pointing this out. We have revised the sentence accordingly.

Comment 16

L145 variables, not quantities

Response:

Thank you for pointing this out. We have revised the sentence accordingly by replacing "quantities" with "variables" in the revised manuscript.

Comment 17

L193, 194 These two equations are different and do something different. Why are there two of them? Which one was used?

Response:

Thank you for this comment. Both equations were used in this study. The choice between Equation (10) and Equation (11) depended on the type of boundary condition or parameter being perturbed, as summarized in Table 1. To clarify this point, we have added an explanatory sentence in the manuscript describing the criteria for selecting each equation.

Comment 18

Table 1: parameter should be variable

Response:

Thank you for this comment. We agree that the original terminology may cause confusion because the table includes both variables and model parameters. We have revised the table heading to improve clarity and distinguish between these two types of terms.

Comment 19

L220-222 First it is said that data of eight stations are assimilated. Then in the next sentence, data of only 5 stations are assimilated. Please eliminate the confusion.

Response:

Thank you for pointing this out. The statement that data from five observation stations were assimilated was incorrect. Data from all eight observation stations were assimilated in this study. We have corrected the text accordingly to eliminate this inconsistency.

Comment 20

Sub-section 2.5 The measured values are mentioned and their uncertainties. In this section briefly the methods used for these measurements should be given. The assumed errors can then be better placed into context.

Response:

Thank you for pointing this out. We have added information on the observation methods in Section 2.5 to provide additional context for the measurement uncertainties.

Comment 21

L225 Why is the reference underscored?

Response:

Thank you for pointing this out. The underlining has been removed from the reference.

Comment 22

L234 delete observation (as “observed” occurs in the same sentence)

Response:

Thank you for pointing this out. We have deleted "observation" as suggested to avoid redundancy in the sentence.

Comment 23

L269-274 I would recommend to just write out full the statistical terms for clarity because some of the abbreviations are not commonly used. In times of online publishing the space saving does not play a role anymore.

Response:

Thank you for this suggestion. We have written out the full names of the statistical metrics when they are first introduced in each chapter and retained the abbreviations thereafter for readability.

Comment 24

L295 “relatively pronounced” This combination does not fit together. Either it is pronounced, or not.

Response:

Thank you for this comment. We agree that the expression "relatively pronounced" was unclear and could be misleading. We have revised the sentence accordingly to improve the description of the severity of hypoxic conditions.

Comment 25

L297 replace: (Figs. 5 and 6)

Response:

Thank you for pointing this out. We have revised the citation accordingly.

Comment 26

Figure 6: the data and their variation in panels (b) and (c) would be better visible and interpretable when the axis ranges would be smaller, i.e. different from those at panel (a). The scatter plots with regression lines are not really useful in this way. After changes being implemented, one may then add a warning in the caption that the axis ranges for the panels are different.

Response:

Thank you for pointing this out. We have revised the figure axis ranges and updated the caption accordingly.

Comment 27

L323 replace (Figs. 9 and 10) ; and check formatting of sentence

Response:

Thank you for pointing this out. We have revised the figure reference and checked the sentence formatting accordingly.

Comment 28

L326 What is reasonable? Please be more specific

Response:

Thank you for this comment. We agree that the term "reasonably" was too vague. We have revised the sentence to provide a more specific description of the reproduced features and improve the clarity of the statement.

Comment 29

Figure 9: Please indicate in the caption that the axis ranges are not different for the different panels

Response:

Thank you for pointing this out. We have revised the caption to clarify the relationship between the axis ranges among the panels.

Comment 30

Figure 10: Similar to Figure 6. Change the axis ranges so that more details will be visible in panels (b) and (c)

Response:

Thank you for pointing this out. We have revised the figure axis ranges and updated the caption accordingly.

Comment 31

Figure 11: Please indicate in the caption that the axis ranges are not different for the different panels

Response:

Thank you for pointing this out. We have revised the caption to clarify the relationship between the axis ranges among the panels.

Comment 32

L351 delete relatively

Response:

Thank you for pointing this out. We have deleted "relatively" as suggested.

Comment 33

L352 replace (Figs. 13 and 14)

Response:

Thank you for pointing this out. We have revised the figure reference accordingly.

Comment 34

Figure 13, figure 14, figure 15: Please indicate in the caption that the axis ranges are not different for the different panels. Also maybe reduce the axis ranges for showing more details

Response:

Thank you for this helpful suggestion. We have revised the figure captions to clarify the axis ranges among the panels and adjusted the axis ranges where appropriate to improve the visibility of the data details.

Comment 35

L372 replace Figs. 16 and 17

Response:

Thank you for pointing this out. We have revised the figure reference accordingly.

Comment 36

L372 suggestion: “lateral” instead of “horizontal”

Response:

Thank you for this suggestion. We have replaced "horizontal" with "lateral" in the revised manuscript.

Comment 37

L403-405 “This represents a significant advancement for this study, as many previous reanalysis datasets have relied primarily on satellite observations, which provide only surface information.” The same information was also given in the previous paragraph and sub-section

Response:

Thank you for this comment. We agree that this statement repeated information already provided in the Introduction and previous sections. Therefore, we have removed the redundant description and streamlined the discussion to improve conciseness and avoid repetition.

Comment 38

L409 Why is the reference underscored?

Response:

Thank you for pointing this out. The underlining has been removed from the reference.

Comment 39

L418 replace (Figs. 8 and 12)

Response:

Thank you for pointing this out. We have revised the figure reference accordingly.

Comment 40

L419 replace (Figs. 16 and 17)

Response:

Thank you for pointing this out. We have revised the figure reference accordingly.

Comment 41

L437 In all figures DO is given in mg/L, but here is written mol/m³

Response:

Thank you for pointing this out. The dissolved oxygen data in the publicly available dataset are provided in units of mol m⁻³, whereas mg L⁻¹ is used in the figures and statistical evaluations presented in the manuscript. To avoid confusion, we have revised the manuscript to explicitly explain this difference and the rationale for using different units.

Comment 42

L438-439 “the dataset includes water level (m) and horizontal velocity components in the x and y directions (m s⁻¹).” It is fine that additional data is included in the dataset. However, it would be good to give little information about the origin of these data. This does not have to be at this position in the text, it may well fit at another appropriate position.

Response:

Thank you for this suggestion. Water level and horizontal velocity are model-derived variables generated by the hydrodynamic model and data assimilation system described in Section 2. To clarify their origin, we have added an explanatory sentence in the revised manuscript.

Response to Referee #2

We would like to thank the referee #2 for the positive evaluation of our dataset and for the constructive comments. We greatly appreciate the time and effort the referee devoted to reviewing our manuscript. All comments have been carefully considered, and the manuscript has been revised accordingly.

Comment 1:

This article is thorough description of a valuable data assimilative analysis of coupled physical and biogeochemical conditions of Ise Bay, Japan. I don't doubt that the data set will be useful for a variety of stakeholders, so it is good to see this being documented clearly in the public domain. The observing network used is comprehensive, leading to a sound outcome, and the analysis spans many years which makes it especially valuable as a synthesis of the long running observation program. There are obvious scientific and societal applications, and the convenience of a coordinated, centralized, model-based, gridded analysis, may supplant the observations themselves for many uses.

Response:

We sincerely thank the reviewer for the positive and encouraging comments. We greatly appreciate the reviewer's recognition of the value of the dataset and its potential scientific and societal applications.

Comment 2:

Regarding the presentation of results: I suggest labeling the black dots (observation stations) in Figure 1 with the same designations as the x-axis labels in Figures 3 and 4. The text descriptions of the figures are repetitive, yet when it came to Figure 11 which shows substantially more deviation of the analysis from the observations, this is not discussed prominently. The summary stats in Figure 4 could be added as annotations on the scatter plots (CC, MSE, etc.). There are many figures that are repetitive in format, and I wondered if fewer, representative graphs would suffice. But this is a data description paper, so perhaps the completeness is appropriate

Response:

Thank you for these helpful suggestions regarding the presentation of the results.

We have revised Figure 1 by adding the station identifiers (A1–A8) to the observation stations, consistent with those used in Figures 3 and 4.

We agree that the deviations between the assimilated results and the observations are greater in Figure 11 than in the other representative examples. Therefore, we have added a statement

in Section 3.2 to explicitly acknowledge these discrepancies and the remaining challenges in reproducing short-term DO variability.

We have retained the current format of the scatter plots because the statistical metrics are already presented in Figure 4, and additional annotations could reduce the readability of the figures.

We appreciate the reviewer's thoughtful comment regarding the number of figures. However, because the primary objective of this paper is to provide a comprehensive description and validation of the dataset, we have retained the complete set of figures as presented. We believe that presenting results for all representative stations and variables will be valuable to future users of the IBRA dataset.

Comment 3:

Table 2 describes an observation type “automatic elevating” but this is not defined anywhere. Is this what is more conventionally described as a “profiler”? Another convention is oxygen units, which if you go to the CF Conventions <https://cfconventions.org/Data/cf-standard-names/current/build/cf-standard-name-table.html> and search “oxygen concentration” the standard usage is either moles per cubic metre or kilograms per cubic metre. Also in common usage is millimole per cubic metre.

Response:

Thank you for bringing this important point to our attention. “Automatic elevating” refers to an automated profiling observation system in which sensors are vertically moved throughout the water column. We have revised the terminology to “Automatic profiling” and added a brief explanation to the manuscript for greater clarity.

We sincerely thank the reviewer for this valuable and constructive comment. We agree that mol m^{-3} is the standard unit recommended by the CF conventions for dissolved oxygen concentration. The publicly available NetCDF dataset follows the CF conventions and reports dissolved oxygen concentrations in units of mol m^{-3} . However, dissolved oxygen concentrations are also presented in mgL^{-1} in the manuscript because this unit is widely used in coastal environmental management and water quality assessment in Japan. To avoid potential confusion, we have clarified this distinction in the revised manuscript.

Comment 4:

Equations (10) and (11) appear to contradict, with ν having units of F in (10) but being dimensionless in (11).

Response:

Thank you for bringing this important point to our attention. We agree that using the same

symbol (ν) in Equations (10) and (11) may cause confusion because ν is dimensional in Equation (10), which represents an additive perturbation, but dimensionless in Equation (11), which represents a multiplicative perturbation. We have revised the manuscript to explicitly clarify the definition of ν in each equation and specify its respective units.

Comment 5:

At line 207, the term “multi G-model” is introduced without definition. Please give a little more description of the model for completeness.

Response:

Thank you for this helpful comment. We agree that the description of the multi-G model was too brief and lacked sufficient detail. Therefore, we have added a brief explanation indicating that the multi-G model represents organic matter as multiple fractions with different decomposition rates, thereby accounting for the heterogeneous degradability of sediment organic matter.

Comment 6:

In section 2.5 the authors describe the assumed observation error and indicate this was chosen by experimentation, which is typical in data assimilation when observation error conflates with representation error. It's beyond the scope of this paper, being a data set description, but the authors might consider doing a posterior analysis of the consistency of the error hypotheses following Desroziers et al. (2005). In a skillful assimilation, the residual misfit should relate to the observation error, and the innovations (prior misfit) to the background error. Test statistics based on these correlations can suggest scalings to the errors that will bring the system into better consistency. The Desroziers paper is a bit dense, and the method is, in my opinion, better explained by Mattern et al. (2018), so I note both papers here: Desroziers, G, L. Berre, B. Chapnik, and P. Poli, 2005: Diagnosis of observation, background and analysis-error statistics in observation space. *Quart. J. Roy. Meteor. Soc.*, 131, 3385–3396, <https://doi.org/10.1256/qj.05.108>. Mattern, J. Paul, C. A. Edwards, and A. M. Moore, 2018, "Improving variational data assimilation through background and observation error adjustments." *Monthly Weather Review* 146.2: 485-501.

Response:

Thank you for this valuable suggestion and for directing us to the relevant studies by Desroziers et al. (2005) and Mattern et al. (2018).

We agree that posterior consistency diagnostics of observation and background error statistics would be useful for further evaluating and potentially improving the specification of error assumptions within the data assimilation system. As noted by the reviewer, such an analysis is

beyond the scope of the present study, which primarily focuses on describing and validating the dataset. Nevertheless, we recognize the value of these methods and will consider applying such diagnostics in future work to improve the data assimilation framework.

Comment 7:

Overall, this is a useful data set that is described well and deserves publication. I have made suggestions above for minor changes, which I do not consider essential but if the authors agree might help polish the presentation. There are remarkably few such data assimilative analyses of estuary circulation, despite the relatively widespread existence of estuary monitoring networks suitable for the purpose. There are even fewer data assimilative analyses that include biogeochemical and physical data jointly, so this is a welcome, novel study that might inspire others to pursue similar efforts.

Response:

Thank you for your positive and encouraging comments regarding our manuscript and dataset. We greatly appreciate your recognition of the value, novelty, and potential applications of the IBRA dataset. We are also grateful for your constructive suggestions, which have helped us improve the manuscript.