



Interactive comment on “Controls on oxygen dynamics in a riverine salt-wedge estuary – a three-dimensional model of the Yarra River estuary, Australia” by L. C. Bruce et al.

Anonymous Referee #2

Received and published: 10 September 2013

In this paper a complete dataset of the characteristics of the Yarra River estuary is presented. The authors focused into the oxygen and salinity dynamics associated with the saline wedge movement and river discharge. The methods applied included the modeling for a better understanding of the processes and particularities of this study area. Summarizing, it is a manuscript with valuable data and interesting results. Nevertheless despite of the interest of the research I found many aspects that can be improved to make the text more attractive for the international reader. Also the addition of some information and an enriched discussion of some of the results would be necessary.

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Abstract

The authors should highlight the benefits of this work at an international scale. Example: Page 9800. Lines 7-10. “Coupled physical and biogeochemical models have been applied to study the interaction of physical processes and seasonal hypoxia, however, application to riverine estuaries with tight curvature and more sporadic periods of oxygen depletion is rare.” If the authors consider this as a new viewpoint of this study they should detail which studies focused into these tight curvature estuaries and why is this remarkable.

Introduction

The introduction is mostly a general review of investigations developed in estuaries but not adjusted to the objectives of this paper. There is a mix of general statements extracted from other authors with some new information about the study area, this is making difficult to 1) have a good knowledge of the local conditions (the authors should presented them clearly) 2) Have a good overview of the connection between literature review and the objectives of this paper. The authors should try to make a better contextualization of the research challenges in these environments and connect them with the Yarra River case.

There is a lack of connection between sentences a few times. Examples: Lines 4-10, lines 11-17.

Page 9801. Line 3. Health

Page 9802. Line 4-6. The sentence needs to be reviewed.

Study site.

Where is Gardiner’s Creek? I don’t see it in the Figure 1. It is commented some aspects about its properties but it never was shown in the results its impact over the model. If it is not relevant, what is the reason for the detailed description that is made?

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10, C4772–C4777, 2013

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Page 9805. Line 4. In the text is commented that the temperature ranges from 4-47 C but in the Figure 2 the maximum reached is 43 C.

Page 9807. AHD should be defined.

After reading the methods section I suggest the addition of the river channel morphology description. In later sections it is commented the effect of changes in the shape, increases/decreases of the depth and even the presence of an island. Also the results indicate that it has a high impact over the model results but this was never explained. The authors should describe this question and also consider what are the implications over the modeling to ensure that the obtained results are including all the elements that affect them.

In the text the authors commented that they have 160 sections of the river, on the light of this information, are the simplifications that they assumed for the modeling (interpolation and smoothing) acceptable from a scientific perspective?

Some assumptions for the model setup are not discussed even if they are strong simplifications. Examples: “salinity and oxygen were linearly interpolated from weekly sampling”, “. . .and found to have strong correlation”. The authors should consider the implications that this has over the model and also be more specific about the correlation of the methods.

Model evaluation

Where is Johnson Street?

One of the main problems of this manuscript is the way of localizing the measuring stations/morphology of the river/processes. The use of very local references as bridge, college and roads makes very difficult to follow the explanations without checking the map. I would recommend the use of a less arbitrary system as naming the places with increasing/decreasing numbers of alphabetical letters that will be easier. Also it would help to have a rough idea of the distance to the sea. In general the authors should

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include any geographical reference mentioned in the text into the Figure 1.

Page 9808. Line 25. "...because different methods of model evaluation tell us different things about model performance". Can the authors be more specific about this sentence.

Model evaluation.

The different calculations of model fit. The purposes that the authors consider for the use of the different methods are not directly applied in this manuscript and they did not include it as an objective itself in the aims description.

Page 9811. Line 1. Is Burrnley Station the same that Burnley Depot?

The authors make reference to the horseshoe bends, can they show them in the map to know which one is the first or the second? In general any description of the river channel as the sill or threshold should be show in the map to avoid misunderstandings.

Page 9811. Lines 1-4. "Model skill scores were all reasonably high and NMAE reasonably low with the exception of Burnley Station." Can the authors define reasonably high and low?

After reading the explanation about the model results with the different methods to do it and Table 3, what is the benefit of having so many different methods to quantify the quality of it?. I think this could be an interesting question for many model users.

Page 9812. Line 7. "These correspond to the regions from 5–10 km upstream and 12–17km upstream of Spencer Street Bridge." I don't see these distances in the figure. I would say that is located at 5-9 km and I don't know how the authors consider that at 12 km there is a change, I don't detect it in figure 7. Also how can they assure that is until 17 km if the maximum distance represented is 15 km?

Page 9812. Line 26. The distances of horseshoe bends are not evident for me in figure 1. Maybe 6500 and 9700 can be possible but the one at 15800 is a 90 degrees angle.

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Anyway for avoiding imprecisions the best would be to mark in the figure the horseshoe bends.

Page 9813. Line 1, It is stated that the “salinity measurements were interpolated from monthly profiles”. Why not run the model until the date when you have collected the data?

I think figure references are wrong from figure 9 that is actually 10 and the same for figure 10 that is 11.

The discussion about the evaluation of the model is not representing an advanced in the state of the art. If the authors consider that this section is necessary they should discuss with broader perspective and not only to remark the quality of the model. A bit of this is observed at the end of section 4.1. but the rest of the discussion is more appropriated for a local journal.

Page 9818. Line 22-23. Review this sentence

Page 9820. Line 6-7. “..and found a strong linear relationship (Fig. 12).” I don’t see this strong linear relationship that the authors consider.

Page 9820. Lines 12-20. This discussion is more adequated for the introduction.

Conclusions.

The first part of the conclusions is only describing general facts that are not very relevant. The conclusions can be improved showing the most outstanding results and quantitative results more that general statements.

Figure 1. What is the meaning of field stations? Some of them were used in this work but others no. Please just add the stations necessities for the explanations. What is the meaning of bottom depth? Would be more correct bottom depth elevation? I added in the previous comments many suggestions for this figure. The fonts are very small and difficult to read.

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Figure 2. I don't see very well the differences between grey and black but it seems that there is a different T and rainfall in Gardiners Creek. How far are the climate stations? How affect this to the results? If Gardiners creek is not use in the rest of the manuscript, why is so carefully explained here?

Figure 3. This figure is good but I don't think that is connected with the objectives of the work. It is not discussed. Remove it.

Figure 4. I don't see well the dots. I don't think that the adjustment is as good as the statistical indicators showed.

Figure 5. The font is very small.

Figure 6. I don't see the arrows.

Figure 12. The correlation is not showing the linear trend suggested. Zones 1 and 2 are not acceptable; Zones 3 and 4 demand a better discussion.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 9799, 2013.

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