

Interactive comment on “Maximum power of saline and fresh water mixing in estuaries” by Zhilin Zhang and Hubert Savenije

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Received and published: 4 April 2019

This manuscript describes the application of the maximum power limit to the mixing in estuaries. The work is based on an earlier publication of the same authors and extends it to a more refined explanation. I found the manuscript novel, innovative, and it was generally well written. I think the manuscript needs mostly technical corrections so I recommend a minor revision. In addition, I think the authors miss an opportunity by not describing the relationship to their previous work in greater detail and draw some conclusions from what can be learned. I think this can provide insights beyond estuaries on the application of optimality principles, and this would fit nicely to the scope of the special issue.

General comments:

#1 Relation to previous work. I think the manuscript would benefit if the relationship to the authors' earlier work is more clearly described and discussed. This concerns the introduction and the discussion/conclusion. It would really help the reader to understand if the previous work contained errors or whether it was an approximation? I find the current description about the previous work was limited by using an isolated systems' view. This is difficult to understand for a reader that is not completely familiar with the earlier work, so this needs a more detailed description and explanation.

#2 Terminology. In the manuscript, the term "moment" is used. Do the authors mean momentum? Angular momentum? Torque? This is not clear to me (I think you mean torque), so I think it would be helpful to briefly describe/clarify it at the beginning.

Minor comments:

- Abstract: I found it not so easy in the abstract to distinguish between background knowledge and the contribution by this paper. A sentence somewhere with "Here we show" or similar would help to clarify this distinction.

- Page 1, Line 18: What is a "working line"?

- Page 2, Line 13: What do you mean by "accelerating energy"? And is N_{fric} not the friction force, rather than energy dissipation, which should be the product of N_{fric} and the velocity?

- Page 2, Line 15: I would clarify it here that you write an angular momentum balance here.

- Page 4, Line 4: I am not an expert in estuaries. Is the one-dimensional advection-dispersion equation standard knowledge? If so, it would be useful to add a standard reference here.

- Page 6: In the evaluation section, I found that I missed some information. Where

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does the data come from? Also, an overview, like a table, of the different estuaries and where they are located would be helpful.

- Page 6, Line 8: “paper”? Do you mean a semi-logarithmic plot?
- Page 6, Line 13: I would it helpful to know more about the Van der Burgh method so I can understand better what is being compared. Specifically, what are the main differences of the VDB method compared to maximum power? This does not need to be extensive, but a brief summary of how the VDB method works would be helpful. At this point, the parameter of the Van der Burgh method, K , should also be introduced and described. Also, how does K relate to the parameter $C3$? They are compared in Table 1, but at present, I do not know what this comparison means. Are they supposed to be the same?
- Page 6, Line 16: The abbreviation MP has not been defined.
- Page 6, Line 17: The reference to the Table is broken.
- Page 6, Line 37: “too saline to use” - to use for what?
- Page 8, Lines 8-10. As mentioned above, I think there is more that can be learned here by comparing this work to the previous work of the authors. At the moment, this is rather short. I think the authors miss an opportunity here to contrast this approach to the previous one. This should help to identify what one can learn in terms of system setup when applying optimality approaches. I think such a more extended discussion would be very suitable to the context of the special issue on optimality principles.
- Page 8, Table A1: “regularly” â€” better “in this study”.
- Page 9: Please explain the terms used in the legend, such as HWS, LWS etc. Also, it would help to relate the estuaries to the ones listed in Table 1.
- Page 23, Figure 3: Please describe what the vertical lines are in the caption.
- Page 23, Figure 4: Please explain what the different symbols are, on the axes and in

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the Figure (link it to the estuaries in Table 1).

- Page 25, Table 1: What does “label” refer to? What is “S0”? What does the “*” refer to in the lines? This table needs more description. Also, I think it refers to the different estuaries, so it would really help to add the names of the estuaries here as well.

Disclosure:

I also want to mention here that I know the second author, Hubert Savenije, very well, and served on the PhD committee of the first author, Zhilin Zhang. I do not think, however, that this impacts my judgement of this work.

Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2018-78>, 2018.

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