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Geoscientific Model Development Discussions
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Interactive comment on "The iFlow Modelling Framework v2.4. A modular idealised process-based model for flow and transport in estuaries" *by* Yoeri M. Dijkstra et al.

Anonymous Referee #1

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This paper introduces a framework iFlow to systematically study the width-averaged water motion and sediment transport. The framework is built in a modular structure combining the strengths of idealised analytical models and complex numerical process-based models. This structure is easily extendable to allow for more processes to be included. It offers an option for both analytical and numerical methods for different systems even those with complex non-linear processes. Also, different turbulence closure schemes are made available within the framework. This framework is evaluated using two examples (the Yangtze and Scheldt estuaries), showing its capability of investigating the tide-river interactions and sediment transport contributions due to different physical processes, and its sensitivity to tidal phases. They also found that inclusion

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of reference levels in calculating estuarine water motion helps to get more realistic solutions.

The framework introduced in this paper can be used to better understand the dominant physical processes of estuarine hydrodynamics and sediment transport. The effort of building up this framework and drafting the detailed manuals is highly appreciated, which will greatly help future users to run the model and promote the study of the dominant physics of estuarine dynamics. However, the paper seems to be not very complete in terms of demonstrating the solution methods and how different processes are separated within those methods. This could lead to difficulties for readers to see the strength of the model and limit potential users to understand their results and extend the framework (e.g., include more processes).

Major concerns:

1, Since being able to identify contributions of different physical processes is one of the main strengths of iFlow, the solution method should be more clearly demonstrated in the paper especially in terms of how different processes are separated. These details seem to be included in the supplemented manual, but including/summarizing the important details in the paper will make it more complete and clear to readers without reading extra tens of pages in the manuals. For example, processes listed in Table 2 could be explained in more detail and some literature using the same approach could be cited here. Section 4.4 seems to suffer the same problem, please add explicit expressions or at least cite existing papers where those detailed expressions are described, for example, in Chernetsky et al (2010).

2, The paper seems to include very heavy technical details about modular structures and running management (in section 2.1-2.2). To make the paper more concise, I think those details should be greatly reduced and preferably integrated in the solution method section (or move to the manual).

3, The perturbation method used within this framework has been extensively used in

previous studies (Chernetsky et al 2010, McCarthy 1993, Wei et al 2016). However, the main assumptions used in this framework are not very clearly outlined in the paper. What main assumptions are used in the model? What are the (unresolved) potentially important processes to sediment transport which need to be added in the framework in the near future? For instance, since iFlow is width-averaged, longitudinal-vertical processes are focused while lateral processes are assumed to be insignificant and not resolved. Also, river branching, which is important in the Yangtze estuary (the 1st study site in the paper), is not included.

4, Different turbulence closure schemes are available in the framework, which one would you recommend to future users for different purposes? A short overview of the strength and weakness of different schemes would make these options more rational and straightforward. On page 27, the authors write “Here we will use the semi-analytical method”. Again, why not the numerical method here?

5, This paper has a few sections lumping different (long) contents, which makes it difficult to locate interesting/important information. For example, in section 4.5, semi-analytical method and numerical method could be separated into different subsections; in section 6.1 (and 6.2), the model settings, and main findings could be put in different subsections.

minor comments:

1, Section 6.1 mainly focuses on the river effects on the tide, while the tidal effect on river is not investigated. So I think the section title “tide-river interaction” should be modified.

2, Page 28, the authors wrote the influence of “climate change”, do you mean sea level rise? Try to be more specific.

3, Table 3, does it work only for M2, M4? Can it be M1, M2, for example?

4, Page 2, by increasingly => by including

5, Page 18, estimated numerically by from => estimated numerically from

6, Page 26, Eq (20)-(21) => Eqs (20)-(21)

7, Page 27, 60-70 => 60-70 km

8, Page 27, the unit of s_{f_0} should be added

9, Page 27, two ETM's

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