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Subject Response to review of iFlow 2.4

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Editor
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Dear editor, dear reviewers,

Thank you for the reviews. We will address the comments of the reviewers individually below

Anonymous reviewer 1

Major concern 1: We agree that it was not clearly mentioned how the perturbation method allows for the separation of processes and agree that at least the main ideas behind this should be illustrated in the paper. Therefore we have extended Section 4.3 (perturbation method) with more equations and explanations for the leading- and first-order hydrodynamics, with explicit connections between the method of decompostion (linearity and principle of superposition), forcing terms in the equations and the terms in Table 2. For the sediment dynamics the text has been expanded to show the connection between the forcing terms in the equations and Table 2, by explicitly referring to the forcing term. The principle is the same for the sediment equations as for the hydrodynamics. For brevity we still refer to the manual for the ordered sediment equations.

Section 4.4 (harmonic analysis) has been restructured with a bit more elaboration. However, we have opted not to include full equations here, since we feel this is not necessary for understanding the main text and would lead to repetitiveness and too much mathematics. References to Chernetsky (2010) and the manuals have been added.

Major concern 2: To our view the iFlow model makes two major new contributions: 1) the modular approach allows for much more flexibility and extendability of the model and is much more user-friendly and 2) on content it contains a vast set of extensions of the model of Chernetsky (2010). The first is to our view important for the future use and development of the model and in the decision of other researchers to use or develop it. The modular structure, running procedure and data management are therefore essential parts of the iFlow model. Since this paper and this journal are aimed at presenting model/software development, we have deliberately aimed at a comprehensive discussion of the modular structure and running management in Sections 2.1 and 2.2. For us, this, together with the mathematical analysis method, is the core of the paper and of paramount importance for providing readers with an idea of what this software looks like and what it can do. Therefore we have chosen to keep these sections.

Major concern 3: In our view, the main assumptions behind the perturbation model were already listed explicitly in Section 4.2. The assumptions on the forcing terms in the semi-analytical version of the model were omitted in favour of generality and may therefore have been unclear. We have changed this and now explicitly list the assumptions on the forcing for the semi-analytical model in Section 4.5. The consequences to the model analysis when choosing this forcing have also

been more clearly stated in Section 4.5

Concerning the unresolved processes: being an idealised model, iFlow will always omit several processes. The relevant question is indeed whether the most essential processes for the investigated phenomena are taken into account. This differs from one estuary to the other and from one investigated phenomenon to another. It is therefore impossible to say, in general, what processes should be added to the model in the future. Concerning the specific cases presented in the paper, we show that there is a good comparison between observations and model results. Although this cannot count as a full proof that iFlow includes all essential processes in these systems, it at least provides confidence that the most important processes are accounted for.

Major concern 4: Recommendations on which turbulence model to use have been added to section 5.1. In the case studies we choose the semi-analytical method whenever it is possible to apply it, since it is faster and more accurate than the numerical method. In the Yangtze case, the numerical method is used because the semi-analytical method cannot be used . This is now mentioned explicitly in the introduction to Section 6.

Major concern 5: Section 4.5 has been separated into a section on analysis of sediment transport and a section on the semi-analytical and numerical methods. As the long discussion on sediment transport is now separate, the part on the semi-analytical method is short and it makes sense to us to group it with the explanation of the numerical method.

Section 6.1 and 6.2 have been splitted as suggested.

Minor comments: 1. the title 'tide-river interaction' has been adjusted to 'river-induced modification of the tidal propagation'

2. reference to climate change has been removed

3. The method can be applied to M_1, M_2 etc. as well. This is now mentioned in section 4.4. By default we will assume that the base frequency is that of the M_2 tide, as this is the most common case.

4.-7. typo/spelling mistake resolved

8. unit has been added

9. ETM has been changed to ETMs.

Reviewer 2: Dr. H.H.G. Savenije

As noted by the reviewer, the iFlow model is indeed developed in such a way that it can be extended easily to include other salinity formulations. Right now, the model offers simple hyperbolic and exponential profiles, as well as a somewhat more involved physics-based model of Wei et al (2016), see Section 5.2 of the manuscript. These salinity models have been sufficient for our applications to date, but might need to be extended in the future. Indeed the model already determines many hydrodynamic parameters, so that there is an opportunity for us or other developers to do this when a possibility and relevant case arises.

Concerning the minor comment: the equation on p22 was missing some x-dependencies. This has been corrected.

Yours sincerely,

Yoeri Dijkstra
also on behalf of my co-authors Ronald Brouwer, Henk Schuttelaars and George Schramkowski