Review

Linking the river to the estuary: influence of river discharge on tidal damping

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Overall Assessment

In this article, the Authors explore the effects of river discharge on tidal wave propagation in estuaries were fluvial discharge in not negligible compared with tidal motion. This is performed in the context of an established theoretical framework. Results are compared with data referring to two estuaries showing good agreement.

The topic of the paper is of great practical and scientific relevance and certainly appropriate for the HESS audience.

Along with this mostly favourable reaction, I do have some **major** reservations regarding the novelty of the paper and the validation of the theoretical model. Indeed, the general impression that I have got while reading the paper was the difficulty to understand what was really new in this contribution. Such reservations are described in more detailed below.

Specific Comments

The major concern regarding this manuscript is related to the novelty of the analytical treatment. Indeed there are at least two previous papers already published by the one of the present authors (Savenije) specifically aimed at including river discharge in the analytical framework of Savenije (1998). They are Horrovoets et al. (J. Hydrol., 2004) and Cai et al. (J. Hydraul. Eng., 2012). I have gone through them too, but I found some difficulty to isolate the original contributions in the present manuscript with respect to the previous. The authors should make to effort to better emphasize the novel aspects of their present approach.

A second concern regarding this manuscript is related to the validation of the analytical treatment. In order to allow for an analytical description of tidal hydrodynamics a number of simplifying assumptions on the equations governing the tidal motion are made. Remarkably, tidal amplitude is required to be small compared to flow depth and flow velocity and flow depth are described by a single harmonic. The model is here validated by comparing measurements performed in two tidally influenced estuaries with the analytical model with and without the inclusion of the river discharge from upstream. According to Figure 9 both theoretical models (with and without river discharge) are capable of well reproduce measurements. If I understood correctly such agreement is performed by calibrating the bed roughness (through the Manning–Strickler friction coefficient K). The slightly better performance of the model with river discharge is demonstrated stating that “*without river discharge we would have required an unrealistically low Manning–Strickler value of K = 30 $m^{1/3}s^{-1}$ to fit the data in the upstream part of Modaomen estuary*”. However, the calibrated value of K = 38 $m^{1/3}s^{-1}$ does not differ much from K = 30 $m^{1/3}s^{-1}$ hence I would not claim that such results represents a a good validation of the proposed model (with river discharge). Also the explanation of the huge variation of K from 48 $m^{1/3}s^{-1}$ to 79 $m^{1/3}s^{-1}$ and to 38 $m^{1/3}s^{-1}$ is not really convincing. In Figure 10 the

performance of the model with river discharge is definitely better with respect to the model without river discharge. However it is not clear which value of Manning–Strickler was employed in this case. The same values employed to calibrate the model with river discharge ($K = 70\ m^{1/3}s^{-1}$ in the upstream part of the estuary)?
To this respect I believe that a detailed comparison of the present theoretical treatment with a one-dimensional numerical model solving the full set of governing equations would be appropriate to find the range of values where the present approach is appropriate. Such an effort, in my view, would tremendously improve the quality of this manuscript.

Editorial Comments

Equation (33): $u_t \rightarrow U_t$.
Table 5. Add a column with the values of the Manning–Strickler K calibrated for Q_t=0.