Hydrology and
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Sciences

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Discussions

Interactive comment on "Analytical approach for predicting fresh water discharge in an estuary based on tidal water level observations" *by* H. Cai et al.

Anonymous Referee #2

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A. General comments

1. The objective is to predict river discharge from observed tidal water levels. The method of the authors is limited to upstream sections where river discharge is dominated over tidal discharge. The example of Datong represents a station at 600 km from the mouth where the tidal range is 0.1-0.2 m (Fig. 5). The measured values may be easily disturbed by ship motions and other variations. The authors should explain why this topic is so important. River discharges are very well known from upstream data. Discharge-stage relationships based on data are available for most rivers. These are easy to use. The method of the authors is fairly complicated and it will be difficult to

determine for which river section it will be sufficiently accurate. Figure 11 shows that the model is not so accurate at low river discharges. The authors should comment on these outlyers.

2. The model equations can only be understood by a few specialists but not by a common reader. It is to the editor to decide whether the paper is intended for the audience of HESS. It is suggested to transfer all equations to an appendix. The text and figures should be given in physical descriptions and explanations. The model should be made available as e.g. a spreadsheet or otherwise (freeware) so that an interested reader can use and check the model. If the authors are unable to do so the I would advise to reject the paper (however to be decided by the editor).

3. The authors should compare their model results to one-dimensional numerical model results to show that their model is sufficiently accurate. 1D numerical models are widely available and easy to operate. A simple estuary can be modeled in a few days with such a model. The authors should made clear what are the advantages of their model compared to a 1D numerical model.

B. Specific comments

Page 7064, line 6: please indicate what the phase lag is for a progressive wave. Do the authors refer to a frictionless progressive wave in a prismatic channel? The authors should further clarify whether the wave from their model is really progressive or not. In other words: is there only one wave travelling upstream or is there a second wave propagating in downstream direction due to continuous reflection by the convergence of the estuary. A discussion on this aspect would be very helpful in understanding tidal propagation in converging estuaries.

Page 7064, line 16: It is no clear why the influence of river discharge is that of increasing friction (by comparing Eq. (19) with Eq. (14). This could be shown in more detail in the appendix.

Page 7067, line 25: During calibration of the model the river discharge should be known. This is in contradiction to the conclusion that river discharges could be deduced from tidal water level observations only.

Page 7068, Eq. (25): From Eq. (21) it follows that ïĄą1 is always negative for relatively small values of ïĄž. If ïĄą2>0 (which is not trivial) then the solution given by Eq. (25) is indeed positive (thus assuming ïĄž«1). Can the authors proof that the 2nd (positive) root never results in a real solution for?

C. Text comments

Page 7056, line 16: rs=B/Bs should be replaced by rs=Bs/B

Below eq. (2): please indicate in which direction the river discharge is positive.

Page 7057, line 25: check if pi should be pi/2.

Page 7060, line 2: "(2014)proposed" should be "(2014) proposed" (insert blank).

Page 7062, line 23: "aveaged" should be "averaged".

Page 7062, line 24: "measurments" should be "measurements".

Page 7063, line 16: "veloicty" should be "velocity".

Page 7069, line 3: change "remarkable" into "significant"?

Table 2: for reasons of clarity I would prefer to write the full equations in Table 2.

Figure 5: how can the water depth decrease in upstream direction if there is a net river discharge? Table 3 suggests that a constant water depth for the 2 sections is being used (10.4 and 9.2 m). Or can the model handle a non-zero bed slope? Some explanation on this is required in the text.

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