

Interactive comment on “Predicting the salt water intrusion in the Shatt al Arab estuary using an analytical approach” by A. D. Abdullah et al.

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The authors constructed a predictive model by analytical approach to predict the length of salt water intrusion in the Shatt al-Arab River estuary. Comparison with in-situ observation shows that model prediction would be improved by considering and estimating water abstractions through anthropogenic usage along the estuary. The overall presentation of the MS is clear, while revisions are needed to improve the scientific value of the MS, before it could be accepted by HESS.

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Our reply: Thank you very much for these constructive remarks. Below we shall reply to your comments, which we shall take into account in the revised manuscript.

Specifics: 1. In section 3 Theory of the analytical model, the analytical model equations are not newly derived by this MS, thus the derivation process should be put in the Appendix. The applications of the analytical model and new modifications to the equations should be clearly presented in section 3.

Reply: In section 3 of the MS, the authors describe the equations used by the analytical model. Detailed description of the deduction of these equations is provided as reference through cited literature. The introduction of these equations was done along the definition of the basic terms, parameters, and description of the relation between the dispersion coefficient and river discharge. Authors consider that such type of information within the MS text helps the reader to better understand the presented content. Authors have no problem in changing this section if requested in the final stage of the MS editing.

2. Results show that the seawater intrusion is controlled by the fresh water discharge and tide, how about other physical factors, such as the variation of sea level, wind direction, width and depth of the estuary? Considering adding discussion of these factors might improve the understanding to the scientific issue on salt water intrusion.

Reply: The model provides a set of analytical equations that can describe salt intrusion in alluvial estuary and predict the impact of interventions such as river discharge, estuary dredging and sea level rise. Wind is not a factor in these equations.

3. The applicability of the predictive model. Considering adding discussion on the model could be used to predict the salt water intrusion in what kind of estuary (wide, narrow, stratified or vertically mixed)?

Reply: The applicability of the model is limited to partially and well-mixed in funnel-shaped alluvial estuaries, where the amount of fresh river inflow per tidal period is small

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in relation to the tidal prism (the quantity of ocean water which enters into the estuary during the flood current). The authors will include this remark in the final version of the MS.

4. Some sentence and words need to be modified. For example, in page 2 line 27, "Liu et al. (2004)" should be "Liu et al. (2004)"; in page 3 line 11, "This is by applying..." should be changed into "This is carried out by ..."; in page 5 line 9, "combing (1) with (2), and (3) with (4) describes the ...", seems should be "(1) with (3), and (2) with (4)", should not simply use "combing", but use more specific words like "multiply, subtract, etc." in deriving the equations.

Reply: Thank you for these suggestions. All specified corrections will be carried out while preparing the revised MS.

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