

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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Received and published: 21 September 2016

The authors presented an interesting application of a 1D analytical salt water intrusion model on the SAR system. The novelty of the study situates in 2 aspects. First, new field data on the salt water intrusion problem on the SAR are collected, presented and analysed, which is as such already a good scientific achievement, knowing the problem of data collection in this difficult geopolitical environment. Second, the analytical model intrusion model was augmented with the predictive equation for the dispersion coefficient of Gisen et al (2015). This model combination shows acceptable performance, conditional to a good estimate of discharge data in the SAR system.

The manuscript is well presented, clearly written, concise and well formatted. Some small editorials are given in the annotated manuscript, but 2 points of concerns should

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still be addressed in a small minor revision.

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 some places in the manuscript, authors refer to personal communications and estimates that are made by local water authority on discharges in part of the SAR system (in particular the Karun tributary). The support for these estimates seems very poor. It would be appropriate to try to consolidate these statements, eventually by clarifying what quantitative information was used by local experts to make such assessments.

Reply: Dr. Salarijazi, our contact source, is a researcher at the Department of Hydrology, Hydrology and Water Resources, Faculty of Water Sciences Engineering, Shahid Chamran University of Ahvaz, Khuzestan, Iran) is a researcher and part of his work is about the hydrology of the Karun River. Based on the contact with him, he provided the first author valuable information and data including tidal level at 10 minutes intervals at Khorramshahr and daily river discharges at Ahvaz for the period 1978-2009.

The experts information are based on several measurements of the water levels and river discharges. Measurements were made during the entire tidal cycle, upstream and downstream the point of discharge from the Karun River into the SAR. This is done just to roughly estimate the discharge of the Karun.

2. The authors focus on the impact of Q_f on D estimates in the combined approach. Yet, D is also affected by T , E , v . It would be good to perform a sensitivity analysis confirming that Q_f is indeed the driving factor in the D uncertainty. Also, the quality of the calibration is not very well presented. From Table 2, we cannot infer the precision of the calibrated D values.

Reply: the other parameter such as T (tidal period), E (tidal excursion), and v (tidal velocity amplitude) have been considered constant along the estuary axis. This was

shown by Savenije (2005) to be a valid assumption with the saline area of an estuary. In fact these parameters have only one unknown variable, which is the tidal velocity. The tidal period T is given (semi-diurnal tide). The relation between the parameters is $E=(vT)/\pi$. E can be observed from salinity observations. The difference between the HWS and LWS salinity curve determines E and hence v . Thus E and v have been estimated on the basis of the salinity survey (see Figure 6). The dispersion depends on the river discharge and the observed tidal excursion. The tidal excursion can be easily observed. So, in this study the focus is on the two unknown parameters, D and Q . A new table will be added to show the calibrated D values. .

Please also note the supplement to this comment: <http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-141/hess-2016-141-RC2-supplement.pdf> Reply: Thank you for all comments. All specified corrections will be carried out while preparing the revised MS.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-141, 2016.

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