Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "A three-dimensional palaeo-reconstruction of the groundwater salinity distribution in the Nile Delta Aquifer" *by* Joeri van Engelen et al.

Anonymous Referee #2

Received and published: 13 June 2019

General comments: This paper describes numerical modelling used to reconstruct the salinity distribution in the Nile Delta aquifer over the past 32 ka. The model simulations include the Holocene marine transgression and various scenarios relating to possible aquifer lithology, and sources of hypersaline seawater. Through consideration of palaeo-environments, the authors aim to better represent the Nile Delta aquifer and an observed freshening. The authors state that simulation of the freshening of the aquifer has not been possible previously using realistic model parameters and steady-state modelling. The objectives of this modelling study are stated as being (p4, L8) to: 1) investigate the physical plausibility of the Holocene transgression hypothesis for the Nile Delta; 2) investigate the influence of the uncertain geology; 3) provide estimates

C1

of the present-day fresh groundwater [FGW] volumes; 4) assess the importance of using palaeo-reconstructions compared to less expensive steady-state modelling. These objectives have been addressed within the study and the description of how this was achieved is generally clearly detailed. There are not very many palaeo-reconstruction type studies looking at saltwater-freshwater dynamics in coastal aquifers and therefore there is some novelty in this contribution. However the significance is not clear. The study relates specifically to the Nile Delta aquifer and the more generalised extension of the science is not apparent. As such the study is primarily a case study, albeit with some interesting insights for other similar deltaic systems. For this manuscript to be suitable for publication in HESS the authors need to indicate how the study provides a substantial contribution, and is not just a case study.

Specific comments: The use of iMOD-SEAWAT has presumably assisted in reducing run times and making modelling of the various scenarios used in the study tractable. The paper would benefit from more information describing the run times and benefits of using iMOD-SEAWAT. I expect that other researchers will find this interesting for similar palaeo-reconstruction type work.

The study involved numerous scenarios and I found many of these confusing as I read through the paper. The section describing the coding of the scenarios needs improvement. For example, I was not able to discern the meaning of P in the scenario H-F-B-P (p10, L1), despite that this was used as part of the explanation of how the coding system works. Additionally, the term 'behavioural' model scenarios (p. 12, L1) seems odd and I suggest changing.