

Interactive comment on “Hydrofacies reconstruction of glaciofluvial aquifers and groundwater flow modelling in a densely urbanized area under changing climatic conditions” by Mattia De Caro et al.

Anonymous Referee #1

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This paper shows a comprehensive investigation of Milan – Po Plain aquifers in Italy, including detailed geology and stratigraphy, hydrochemistry, human factors, etc. The authors did a lot of field works, collected many data and conducted a huge hydrogeological model. However, in my opinion, the manuscript needs to be improved to be published on HESS. The paper structure is well-organized, but some sections remain unclear. The introduction is vague and too focused on general aspects. The structure of this manuscript is more like a hydrogeological survey report or groundwater modelling summary, not a research article. Motivation is not clearly stated and the objectives

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are vague and of weak scientific interest. Why did you do this study and what scientific questions are answered? Note that the objectives of this paper are differently stated in the abstract and in the Introduction. I recommend fixing the main significant scientific objective, as in my opinion, the multi-dimensional approach used for the reconstruction of aquifer geometry. The objectives and conclusions do not represent a relevant advance to scientific knowledge related hydrogeological characterization. I encourage the authors to address the scientific issues, restructure the manuscript and resubmit the paper.

Because it is a research article instead of a report, the authors are expected to explain why Milan – Po Plain aquifers are important and interesting to study in a scientific point of view, not only for the need of groundwater managing purposes. These aspects have to be clarified and illustrated in the manuscript. The authors used a great proportion of the words in this manuscript to introduce and describe the field works and data collections, data treatment, conceptual model description and model results. Again, I would recommend the authors to focus on the discussion of main significant scientific objective, i.e. the reconstruction of aquifer geometry and how this can be assessed by means of groundwater modeling. The Results and Discussion sections are too long and show repeated information and the resulting redaction is unclear. These sections have to be rewritten and shortened. The Discussion Section is a description of how the numerical model was constructed and performed, and how this is supported by the literature. The rest is a general overview of the results of the model versus measurements (heads, river outflows, recharge . . .) and also the result of the future scenarios simulations. Section 4.4 (Model Calibration) is weak. No relevant comments about the methodology used for calibration. No relevant comments are focused to justify the obtained model calibration statistics. No comparison between the initial (conceptual model) and calibrated parameters (K , S_s , Recharge, etc.). No comparison between initial groundwater budget derived from conceptual model statement (in the whole or in a certain period) respect the obtained by modeling. Some of these issues are weakly illustrated in some parts of the text and in some figures, but I consider that an integra-

tive and detailed explanation is needed. No sensitivity analysis of the parameters used in the model is commented. It is interesting to state any trends of hydrochemistry data variation along time, related to changes in land uses and anthropogenic factors. And a specific discussion of the effect of contamination/pollution/human factors to data is desired. Authors have to explain how the reconstruction of aquifer geometry can be assessed by means of groundwater modeling and justified by means of a sensitivity analysis. Conclusions are too general and obvious. The authors do not need to mention the results of the numerical model in the conclusion part. Authors could use the last section of the paper to extend their discussion to make clear the new contributions that the manuscript supports. Include important implications of your work on the scientific community and also for local groundwater management.

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