

***Interactive comment on* “Sensitivity of Hydrologic and Geologic Parameters on Recharge Processes in a Highly-Heterogeneous, Semi-Confined Aquifer System” by Stephen R. Maples et al.**

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GENERAL COMMENTS

COMMENT: “The manuscript “Sensitivity of Hydrologic and Geologic Parameters on Recharge Processes in a Highly-Heterogeneous, Semi-Confined Aquifer System” describes an interesting study on local and global sensitivity analysis in the framework of Managed Aquifer recharge, using a realistic case study. Overall, the manuscript is well written and the results are illustrated in a clear manner. Although the research work heavily relies for the creation of the geological model and the setting up of a flow model and MAR on two previous works, the additional research performed in this study

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and the new findings justify a new publication. I only have a couple of minor suggestions and some technical details.” RESPONSE: Thank you for the comments. We have addressed your comments, and have provided responses to each specific comment below.

SPECIFIC COMMENTS:

COMMENT: “Control volume and connectivity metric (lines 179-188; 331-333) Please double check the definition of the control volume and the need for a 6-points connectivity metric: if the control volume is defined as “encompassing vertically-coincident cells” (line 179), then there is probably no need to require a 6-points connectivity metric. For example, with a 6-points connectivity, you can have 2 very horizontally extended layers of a conductive material, separated by a rather impermeable aquitard; if only one cell of the aquitard is conductive, then the 6-points connectivity guarantees connection. Maybe I missed the definition of the control volume. Is it defined by only one cell in the horizontal directions?” RESPONSE: We agree that the definition of the control volume was unclear, and have made substantial changes to section 2.4.2 to re-frame and add detail to how site characteristics are presented. For example, we have added the sentence (lines 187-189): “Percolation was evaluated for a control volume encompassing all cells from the land surface to the initial water table depth (i.e., unsaturated-zone cells) at the 25 x,y cell locations encompassing each site.” Because each control volume incorporates both vertically- and horizontally-connected cells, the 6-connectivity metric is necessary to evaluate percolation. We believe that the clarification regarding the definition of the control volume will make this clear to the reader.

COMMENT: “Linearity (197-200) As your aquifer is not confined, maybe the fact of separating the contribution of each recharge/no-recharge scenario would not work properly as in the case of a linear problem. Please comment on this.” RESPONSE: Thank you for pointing out some of the limitations associated with the differencing approach we use to post-process the results. We have added several sentences to the Discussion section to acknowledge the limitations of this approach for non-linear models, and also

noted that we did not encounter spurious recharge stresses or unrealistic model noise when using this approach with our model. (lines 517-521)

COMMENT: “r sign In general, for a negative correlation a negative r is used (line 315, but also the corresponding figures).” RESPONSE: Thank you for catching this mistake. We added text to point out that R_10d, R_30d, and P_30d were positively correlated with all simulated outputs, but V_fines, 90d was generally negatively correlated with simulated outputs. We made changes throughout the text to report negative correlations appropriately, and have modified Fig. 5 to make clear that correlations are reported as the absolute value.

FIGURES

COMMENT: “Fig.1 and Fig.3 Please report the original publication source of the figure.” RESPONSE: We have reported the original source of Figure 1 (Maples et al., 2019), but Figure 3 is unique to this publication, and thus does not have a publication source, so the Figure 3 caption was left as-is.

COMMENT: “Fig.8 Do you also have a map of IVF? It would be nice to see it on the side of the R30d (see also line 370).” RESPONSE: We chose not to overlay a map of IVF on our stochastic geologic model because our findings are presented as a proof-of-concept of a hypothetical, but physically-realistic domain (see lines 515-517). Instead, we rely on citations of the relevant studies that have identified IVF in this region and encourage the reader to seek those publications for additional information.

TECHNICAL CORRECTIONS

COMMENT: “line 63 :1640 m²” RESPONSE: Thank you for catching this mistake. We have changed “1640m²” to “1640 m²”

COMMENT: “Parenthesis: Double check journal guidelines for parentheses (i.e. lines 67, 76-77, 87, 91)” RESPONSE: We have checked the manuscript preparation guidelines for HESS and did not find specific guidance for these instances of parentheses.

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We will defer to the associate editor and copy editor to provide guidance on these instances.

COMMENT: “Units repetition. It would be more correct to report units close to each number, for example $1 \times 2 \times 3$ m should be something like $1 \text{ m} \times 2 \text{ m} \times 3 \text{ m}$ (see lines 99, 101). This is also valid when a list of numbers (with unit) is reported. See for example line 308, 309, 320.” RESPONSE: Thank you for catching this mistake. We have made changes here and elsewhere throughout the manuscript to correct unit repetition issues.

COMMENT: “Subscript fonts In general, subscripts that are not index should not be in italic font (i.e., Ss should be S_s instead) (see line 110 and other locations in the text)” RESPONSE: Thank you for catching this mistake. We have made changes here and elsewhere throughout the manuscript to correct italicization mistakes in subscripts.

COMMENT: “lines 123-124 Check ‘0 m amsl’.” RESPONSE: We are leaving the acronym as-is because above mean sea level (amsl) is introduced previously in Section 2.1 (line 77)

COMMENT: “UZ (line 141) Please introduce this acronym.” RESPONSE: Thank you for catching this mistake. We have changed “near-surface UZ cells” to “near-surface unsaturated-zone (UZ) cells”

COMMENT: “line 165-166 Ss or SS?” RESPONSE: Thank you for catching this mistake. We have changed “K_S” to “K_s”

COMMENT: “Vfines,90d Double check the consistency of this symbol within the documents (see for example Fig.5).” RESPONSE: Thank you for catching this mistake. We have fixed the figure accordingly, and have double-checked the consistency of its usage throughout the text.

COMMENT: "line 479 “to be fully...”? " RESPONSE: Thank you for catching this mistake. We have changed “challenging to fully captured” with “challenging to fully cap-

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ture.”

COMMENT: "line 538 “to incorporate a measure”" RESPONSE: Thank you for catching this mistake. We have incorporated the edit.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-412>, 2019.

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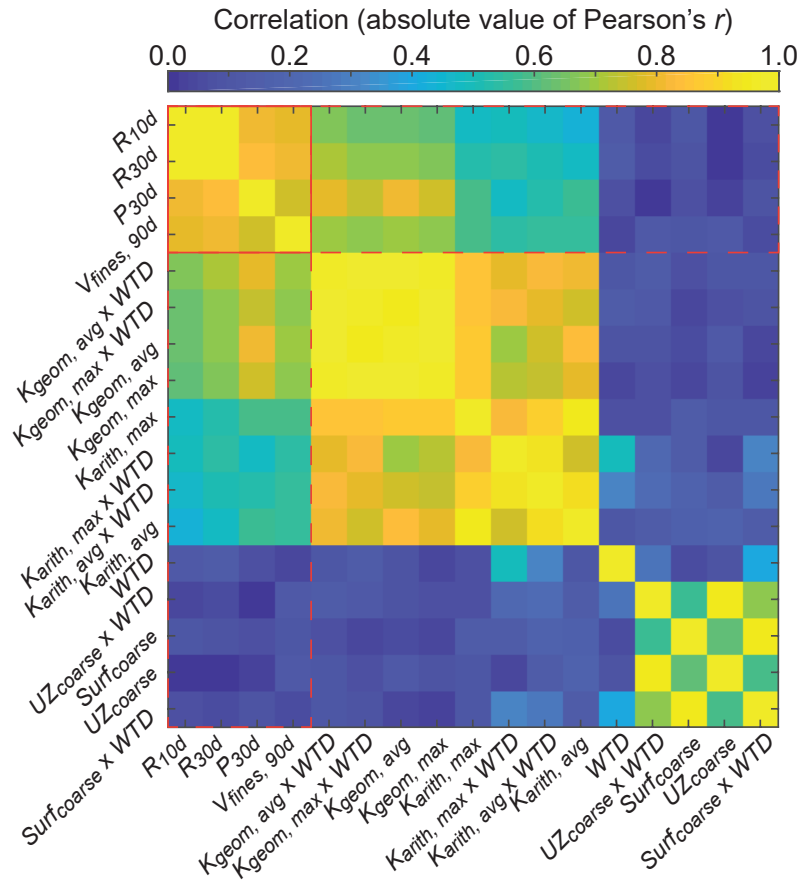


Fig. 1.

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