Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Physics-inspired integrated space-time Artificial Neural Networks for regional groundwater flow modeling" *by* Ali Ghaseminejad and Venkatesh Uddameri

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Comment: The manuscript presents the development of an integrated space-time Artificial Neural Network (ANN) model guided by the governing groundwater flow equation. The developed model is used to model regional groundwater flow in a portion of the Ogallala Aquifer in the Southern High Plains of Texas as an illustrative case study. The model was able to capture the general trends and provided groundwater level estimates that were better than using historical means. The methodology and the observations presented in the article is interesting and worth publishing the reference list is appropriate to the area of the investigation and up to date. A few interesting conclusions are

stated in the paper. However, there are some minor concerns, but they are not very important. In my opinion the article may be published after a minor revision.

Response: We thank the reviewer for the overall positive comments concerning the work. We also appreciate the reviewer's specific comments and concerns. We agree with all of them and have necessary changes as stated below.

Specific comments: Comment: Page 8: Figure 2: There is no discussion regarding Figure 2 (b). The citation of Figure 2(b) is presented in the captions of with Figure 5 and 7. I think adding a description of 2 (b) in the data compilation section will be helpful.

Response: We thank the reviewer for this comment. We agree a short description following the figure would make the presentation clear. We have added a sentence in the Data Compilation Section that explains the Wells shown in Figure 2b. The statement added after line 189 is as follows: "Twelve wells shown in Fig. 2b were selected to illustrate the temporal variability within the study area."

Comment: Page 9: Line 231: I think there is some error with the citation of Table 1 here. Table 1 in the manuscript presents Performance error metrics.

Response: Thank you for your comment. The line should refer to Fig 2a rather than Table 1 and we have corrected this error.

Comment: Page 10: Line 237: "mode"- I think it will be model.

Response: The word "mode" was used to refer to the one-step ahead forecasting approach. We have replaced the word mode with 'manner' to avoid any confusion.

Comment: Page 13: Line 318: The preposition before "38 well" is missing.

Response: Thank you for your detailed review. We have added the word 'at' to correct this error.

Comment: Page 14: Figure 5. And Figure 7: Y-Axis levels are not visible.

Response: Thank for your suggestion. We have increased the font of the axis labels to make them more visible. (Please see attached Figures).
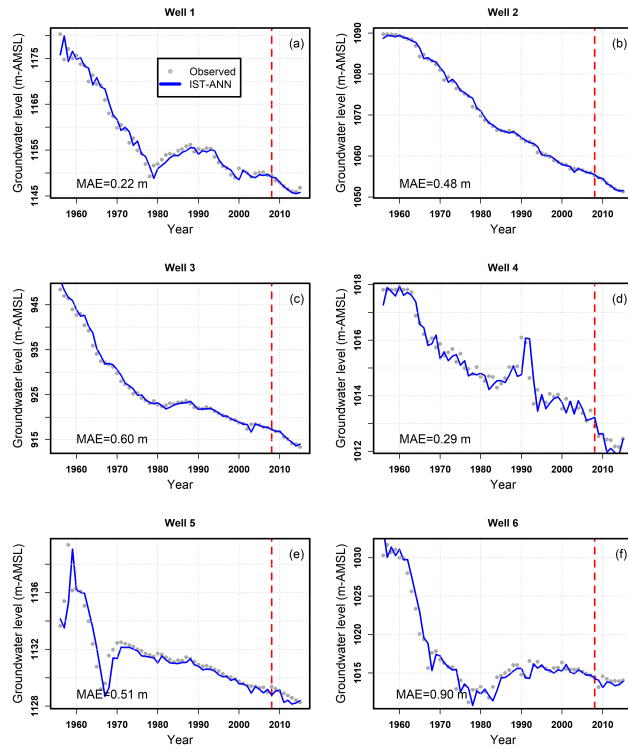
Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2020-117, 2020.
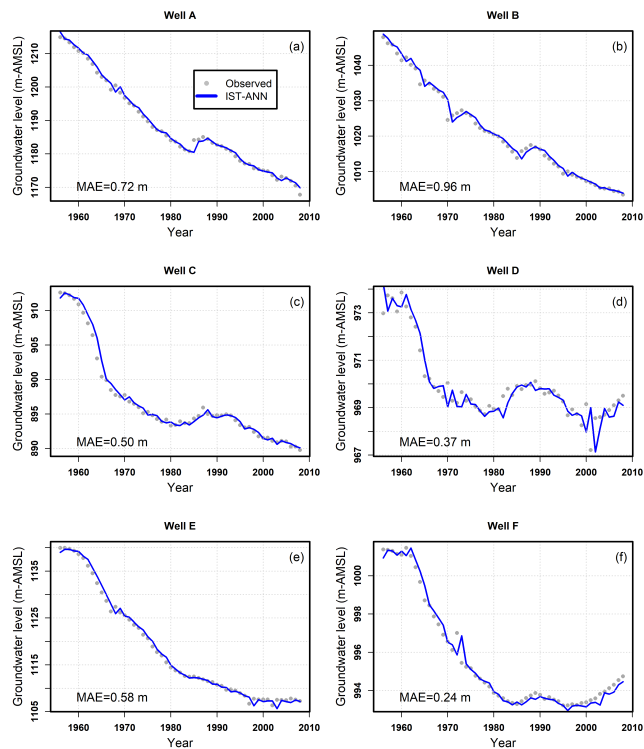
Fig. 1. Figure 5. Well hydrographs at select training wells during the calibration period 1956–2008 (also see Fig. 2b for well locations)

Fig. 2. Figure 7. Well hydrographs for representative testing Wells within the study area (see Fig. 2b for locations of these wells; The right-hand side of the model denotes forecasting period)

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