

Interactive comment on “A new data assimilation approach for improving hydrologic prediction using remotely-sensed soil moisture retrievals” by W. T. Crow and D. Ryu

W. T. Crow and D. Ryu

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Reviewer #2

Major point - Referee #2 questions the use of an API model for the rainfall correction portion of the experiment and asks some justification for our particular (half identical/half fraternal twin) methodology. They suggest modifying the approach to be fully consistent with an identical twin experiment.

Response: These comments are similar to those made by Reviewer #1. See the response to the major comment of Reviewer #1 for a response and a description of relevant changes to the revised manuscript.

The only substantial difference between the two comments is Referee #1's suggestion that we employ pure identical twin experiment approach and Referee #2's preference that the approach be based on a pure fraternal twin experiment. We would like to re-iterate that we chose a compromise between the two (an identical twin experiment for the state correction and a fraternal twin experiment for the rainfall correction) in order to provide the most credible analysis. The central conclusion of the paper is that our rainfall correction approach adds measurable skill to runoff predictions above and beyond that obtainable from only antecedent state correction. By choosing easier identical twin set-up for the state correction - relatively to the more difficult fraternal twin set-up for rainfall correction - we are attempting to maximize the credibility of synthetic results which demonstrate increased runoff skill associated with utilizing our rainfall correction scheme (either alone or in tandem with a common state-only approach). Accepting the advice of either reviewer, and adopting an either pure fraternal or identical twin set-up, would make it easier to obtain positive results (with regards to the additive utility of correcting rainfall) but would make such results less credible. This key point is clarified in new text added to Section 5 (last paragraph), Section 7 (3rd paragraph) and Section 8 (last paragraph) of the revised manuscript.

Minor points

1. Comment: Title: Since the article focuses primarily on runoff prediction, would it be better to say "runoff prediction" rather than "hydrologic prediction".

Response: Good point - title has been changed.

2. Comment: Page 2010, paragraph 2: mentions Figure 1. I guess the point of this figure is to show that you are considering basins with considerable range of runoff ratios? If yes, mentioning in the text would help in understanding the relevance of this figure.

Response: New text has been added to Section 2 to motivate Figure 1.

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3. Comment: Page 2016: typo in reference (Dunn and Entekhabi should be Dunne and Entekhabi)

Response: Typo has been fixed.

4. Comment: Page 2023: "As demonstrated in Fig.2" - shouldn't it be Fig.1?

Response: Yes, typo has been fixed.

5. Comment: Figure 2: needs labels for each time series data

Response: New labels have been added to Figure 2.

6. Comment: Figure 6, 7, 8, 9, 10: Might be good to mention what the "fraction" is (Fraction of what and what)

Response: Axis labels on Figures 6, 7, 8, 9, 10 and 11 have been changed so they no longer refer to "fraction of open loop RMSE" but rather simply "normalized RMSE". In addition, new text has been added to Section 6.1 to clearly define the term "normalized RMSE". This should address the confusion noted by the reviewer.

7. Comment: Figure 6 caption: mentions Fig.3 - shouldn't it be Figure 4?

Response: Yes, typo has been fixed.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 2005, 2008.

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