

Interactive comment on “The impact of near-surface soil moisture assimilation at subseasonal, seasonal, and inter-annual time scales” by C. Draper and R. Reichle

C. Draper and R. Reichle

clara.draper@nasa.gov

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Interactive comment from Imtiaz Dharssi

- We appreciate Dr Dharssi taking the time to comment on our manuscript. His comments are reproduced below, with our response to each provided as a bullet point.

This is an interesting paper which demonstrates that assimilation of satellite derived surface soil moisture (SSM) measurements improves the soil moisture analysis com-
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pared to an open-loop control that has no data assimilation. I humbly ask the following questions:

1) A discussion of the practical applications of the research described by the manuscript would be very useful. Do meteorological reanalysis systems such as the Modern Era Retrospective-analysis for Research and Applications (MERRA) assimilate satellite derived surface SSM measurements? If not, what is the reason? Similarly, do Numerical Weather Prediction (NWP) centres operationally assimilate satellite derived soil moisture?

- The opening sentences of the introduction have been rephrased to insert citations of the soil moisture assimilation literature, to provide the reader with any necessary background on soil moisture assimilation. Additionally, in the conclusions it has been noted that the outcome of these experiments suggests that the representation of the surface climate in reanalyses could benefit from the assimilation of long soil moisture data records.

2) How does the skill of the open-loop simulation in this research compare to soil moisture analyses from the ECMWF ERA Interim? Would it be possible to provide values of temporal and anomaly correlation between model open-loop and ARS in-situ soil moisture? From figure 6, it appears that the model open-loop poorly captures the seasonal and inter-annual variations in soil moisture at the Little River site and I wonder if this is a common problem.

- The Catchment model used here is an established model that has been presented and evaluated on many occasions (Reichle et al, 2007; Liu et al, 2011; Draper et al, 2012; De Lannoy et al 2014), most often using the correlation / anomaly correlation. The evaluation metric used in this manuscript is the unbiased Mean Square Error with respect to the ARS in situ soil moisture. This

is provided for the model open loop, and discussed at length in the manuscript. The use of an alternative approach to evaluation (partitioning into time scales) has indeed highlighted that the open loop does struggle to capture some of the seasonal and inter-annual variations (as does the AMSR-E data), and while it would be very interesting to check whether this is a common problem in other models, this is beyond the scope of the current study.

L24P7986 says the site is Little Washita which I presume is a typo.

- Yes, this has been fixed.

My comments should not be interpreted, in any way, as a criticism of the manuscript.

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