

We would like to thank the reviewer for the thoughtful comments and suggestions. Based on the feedback, we have made significant changes to the manuscript. We believe that the article is now much improved and again appreciate the help from the reviewers. See below for our detailed responses to all comments.

Note that the reviewer's original comments are in regular black fonts and our responses are in *red italic fonts*.

Reviewer #1

This paper presents a study on uncertainties and errors in terrestrial snow assimilation, and is thus within the scope of HESS. It is a well-developed concise article using clear language, and as such, it is a fine addition to the scientific knowledge. However, the experimental set-up lacks some details and references. For example, no information is given about FORCING1, FORCING2 and the 4 other forcing datasets before section 4.

Lines 57-59: This sentence is too speculative; there are many steps to reach that conclusion. Since it is part of the motivation for this article, please expand on the explanation and add references.

The sentence has been modified as follows with the inclusion of the appropriate reference.

“The accuracy of the model error covariance therefore, greatly depends on the accuracy of the forcing input (Reichle and Koster (2003)). “

Equation (2): Please say what the exponent “T” refers to.

Text has been added to say ‘exponent T refers to the transpose of a matrix’

Line 124: Add a reference corresponding to the NOAH LSM v3.3.

The reference for Noahv3.3 (Ek et al., JGR, 2003) has been included.

Lines 150 and 160: Do you mean synthetic observations?

Yes. The qualification has been included in these lines.

Lines 152-153: Does it mean the OL was an ensemble run? If so, please justify/clarify.

As noted in the article, OL is conducted as an ensemble run that includes the perturbations. This approach is used to exclude any changes in skill introduced by the perturbation scheme in the evaluation of DA results. The text has been modified as:

“Note that the OL_FSNGL configuration includes the ensemble perturbations to the

forcing and model state fields, to exclude any changes in model skill introduced by the perturbations in the evaluation of the DA results”

Lines 179-180: No prior information is given on the forcing datasets.

The section has been updated to include the information about all the forcing datasets. The control run is conducted using NLDAS-2, open loop with AGRMET and the forcing ensemble includes AGRMET, GDAS, ECMWF and MERRA-2.

Line 213: Please add reference or website.

The references to the AMSR2 product (Oki et al. 2010, Kachi et al. 2013) are given earlier in the text. We have added the reference to the website (http://suzaku.eorc.jaxa.jp/GCOM_W/data/data_w_index.html) within the text.

Table 1 and line 258: Is it cumulative in time? Please clarify.

Yes, the table values are cumulative in time.