**Hydrology and
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Interactive
Comment

Interactive comment on "The COsmic-ray Soil Moisture Interaction Code (COSMIC) for use in data assimilation" *by* J. Shuttleworth et al.

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Reading the title, I have been suddenly very interested by the topic of the paper as I believe that the capability of cosmic-ray method to obtain area-average soil moisture at the large scale could provide a significant added-value for soil moisture assimilation in land surface or rainfall-runoff models. I quickly went throughout the paper for looking at the results of the soil moisture assimilation into the Noah land surface model. Unfortunately, I found the description of the data assimilation results to be not good as expected. I am fully aware that the main purpose of the paper is to describe the new physically-based COSMIC model for interpreting quickly modelled soil moisture proïňĄles in terms of the above-ground fast neutron count. However, two major problems in the description of the data assimilation results have to be surely addressed in

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the paper.

Firstly, the method used for assimilating the cosmic-ray data into the land surface model is not described at all. Which is the data assimilation technique used? pre/post-processing of the data is made? Secondly, the improving of the Noah simulations after the assimilation of the COSMOS probe count is limited to the elimination of the BIAS between modelled and observed data. However, it is well-known that the improvements related to the assimilation of soil moisture data (and not only) have to be evaluated not in terms of BIAS reduction but for reducing the random errors between model and observations. For instance, see the detailed and clear discussion in Draper et al. (2011) or in Yilmaz and Crow (2013).

I suggest addressing these two aspects for allowing the reader to understand (and evaluate) the data assimilation part of the paper.

References

Draper, C., Mahfouf, J.-F., Calvet, J.-C., Martin, E., and Wagner, W.: Assimilation of ASCAT near-surface soil moisture into the SIM hydrological model over France, Hydrol. Earth Syst. Sci., 15, 3829-3841, doi:10.5194/hess-15-3829-2011, 2011.

Yilmaz, M.T., and Crow, W.T.: The optimality of potential rescaling approaches in land data assimilation, in press, Journal of Hydrometeorology, doi:10.1175/JHM-D-12-052.1, 2012.

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