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Interactive comment on "Assimilation of SMOS soil moisture into a distributed hydrological model and impacts on the water cycle variables over the Ouémé catchment in Benin" *by* D. J. Leroux et al.

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Thank you very much for the fruitful comments you collected for this study.

We agree that the goal of this work has not been well defined at all. The two anonymous reviewers and Dr. Marielle Gosset gave us very good advice on how to improve the manuscript.

We are considering the remarks from all the reviewers and have been working hard on the reorganization of the manuscript. We would like to suggest the following layout for the submission (see below). Moreover, one author has joined us: Luc Séguis, HydroSciences, Montpellier, France. I hope it is possible to add him as co-author of

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Discussion paper

this paper when we will resubmit.

Thank you very much again for your work.

* Title

Assimilation of SMOS soil moisture into a distributed hydrological model and impacts on the water cycle variables over the Ouémé catchment in Benin

* Abstract

- quasi real time (RT) rainfall forcing are not accurate enough for hydrologic RT applications but post-adjusted rainfall products are only available several months after observations

- soil moisture assimilation of SMOS observations can correct for the inaccurate amount of water brought by RT rainfall forcing

- soil moisture is adjusted, which has a positive impact on water table depth and streamflow simulations, which can lead to a better management of available water resources and extreme events

*Introduction

- water cycle, hydrologic modeling, scarcity of in situ measurements in tropical regions, monsoon impact on people life

- RT rainfall forcing are not very good, but post-adjusted rainfall products are only available 2-3 months later

- assimilating soil moisture is assessed to correct for wrong amount of water brought by RT rainfall forcing

* Data, model and methodology

- in situ measurements (soil moisture, streamflow, precipitation)

- rainfall satellite products

— RT and post-adjusted and the delay of availability

— in situ and post-adjusted are very close

- DHSVM model

— description of the model

— calibration of the model using in situ or post-adjusted rainfall forcing

— simulations using RT rainfall forcing

- SMOS soil moisture

- assimilation method: optimal interpolation

— description of the method, the assumptions, how to deal with the resolution differences

— description of the experiment: simulations using RT rainfall forcing with SMOS soil moisture assimilation

* Results and discussion

- correction of the soil moisture (control variable)

- impact on the water table depth simulations

- impact on the streamflow simulations

*Conclusion

- soil moisture corrected by SMOS assimilation

- positive impact on the water table depth simulations => can lead to a better simulation and management of the actual ground water resources (RT application)

- positive impact on the streamflow simulations => can lead to a better simulation and management of extreme events such as floods during the monsoon period (RT application)

- this work shows the possibility to implement a near real time hydrologic framework for RT applications wherever it is possible to obtain a proper calibration of the hydrologic model beforehand, which is one limitation of this method (or optionally, the RT rainfall products could be directly corrected using SMOS observations, work in progress in LTHE, Grenoble)

- assimilation method needs to be improved and ensemble technics should be used to avoid any assumptions on the errors of the model and the observations

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