

# ***Interactive comment on “A theoretical approach to assess soil moisture–climate coupling across CMIP5 and GLACE-CMIP5 experiments” by Clemens Schwingshackl et al.***

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*We thank the two reviewers for their valuable comments. In the following we explain how we implemented them. You find our answers in italic.*

## **General comments**

**The paper seems to be very technical and not intended for a "lazy reader". It would be great if authors do something to make it more understandable for those who are doing research in adjacent fields of earth system dynamics, but I am not**

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**sure that it would be an easy task.**

*In order to make the basic idea better understandable we are going to add a new paragraph at the end of Section 2 that summarizes the main concept in the following way:*

*"Schwingshackl et al. (2017) provide a theoretical approach that can easily be applied to quantify the effect of soil moisture variations on EF and TX based on the distinct sensitivities in the different soil moisture regimes. In the present study, this approach is used to theoretically quantify the effect that soil moisture shifts across different GLACE-CMIP5 experiments (see Section 3.1.1 for details) have on EF and TX. To distinguish direct and indirect soil moisture effects on EF and TX the theoretical estimations are compared and contrasted to direct estimations of the coupling strength. The (dis)agreement between the direct and theoretical estimations provide an indication whether soil moisture affects EF and TX directly through its control on the partitioning of net radiation into latent and sensible heat fluxes or if the coupling involves secondary effects. The following methods section explains the detailed derivation of both measures as well as their application to quantify soil moisture-climate coupling in both CMIP5 and GLACE-CMIP5."*

### **Specific comments.**

**The following comments formulated in the form of questions are not substantial, but they might help authors to improve readability of the paper. "Here we present a theoretical approach ... " 1. Is this approach presented or proposed? 2. Is this approach theoretically justified? 3. Is the validity of the approach illustrated with an example?**

*The theoretical approach based on the identification of the  $EF(\theta)$  curve was validated in our 2017 Journal of Climate paper (Schwingshackl et al., 2017). In that publication*

*we validate the approach and show an exemplary  $EF(\theta)$  curve based on real data that essentially follows the framework that is shown in Fig. 1a of the present study. The present study uses the validation of Schwingshackl et al. (2017) as basis and applies the  $EF(\theta)$  framework to investigate soil moisture-climate coupling in CMIP5 and GLACE-CMIP5 data. Hence, we think that the phrasing “Here we present a theoretical approach” is more adequate than “Here we propose a theoretical approach”.*

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