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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Temporal stability of soil moisture under different land uses/cover in the Loess Plateau based on a finer spatiotemporal scale" *by* J. Zhou et al.

Anonymous Referee #1

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OVERVIEW

The paper investigates the soil moisture spatial-temporal dynamics for different land uses/cover types in a hilly landscape of the Loess Plateau in China. Specifically, an empirical model called ET-TSSM, based on the temporal stability concept, is developed and applied to the collected soil moisture dataset on several micro-plots. The proposed framework can be used to investigate quantitatively the different soil moisture behaviour for different land uses/cover. In this study, the hydrological processes during dry-to-wet (DTW) and wet-to-dry (WTD) periods are analysed.

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GENERAL COMMENTS

The topic investigated in the paper is surely of interest for the readers of HESS. In fact, the understanding of the main drivers of the soil moisture spatial-temporal variability in different climates and land uses/cover types is needed for improving the soil moisture modelling at different scales. The ET-TSSM model proposed in this study might be a valuable tool to address this issue. However, I found several aspects that should be significantly improved for allowing the reader to clearly understand (and possibly reproduce) the proposed methods and results.

The main problem is related to the description of the methods. Firstly, some parts should be revised because of errors. For instance, equations (9) and (11) of the standard deviation are wrong. At the denominator it should be “n” (or “n+1”), not 6. Other errors are also present, please check. Moreover, all the equations should be rewritten in a general form, without making reference to the number of sites and points analysed in this study. Secondly, and more important, it is not clear to me (as hydrologist) why the different parameters WP_n, WD_n, θ_s, ... are defined and what they represent. A clear definition of these parameters and why the authors intend to use these specific values to characterize the soil moisture dynamics is missing. For instance, the different equations and symbols reported in Figure 2 are very difficult to be understood. Thirdly, it reads at page 10093 that “some evapotranspiration curves” are fitted to the data. But, which curves are employed? Which type (linear, polynomial, power)? Which are the parameters of these curves? The authors should significantly revise the methods section. I strongly suggest describing the main rationale behind the proposed ET-TSSM model at the beginning of this section.

Another important drawback of this study is that a single DTW (and WTD) period is analysed. This is not sufficient to understand the real soil moisture dynamics as the recession of soil moisture varies a lot during different WTD periods as a function of climate forcings (e.g. higher/lower evapotranspiration). The analysis of a single WTD period can only characterize a single recession period and it can be hardly generalized

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to understand the overall soil moisture behaviour. This issue should be underlined in the paper and, possibly, different WTD periods should be analysed. In previous studies *Wang et al. (2012, 2013)*, the same authors analysed continuous soil moisture timeseries obtained from fixed probes in the same study area. This data could be used to better generalize (if possible) the soil moisture behaviour through the ET-TSSM model.

Related to the above issue, the generalization described in Figures 10, 11 and 12 is not clear. Many information are provided in these figures and probably it is not sufficient a paper for describing them. The description of the hydrological processes provided in these figures and in the corresponding text is too general and is not really related to the results reported in the study. In my opinion, this part should be removed or strongly smoothed.

Finally, the English writing and the grammar should be revised by a mother tongue (who I am not). Several sentences are unclear and some grammar errors distract the reader from the understanding of the technical content of the paper. I did not make a detailed proof-reading as I believe that some parts of the paper should be significantly revised.

On this basis, I believe the paper requires a major revision.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 10083, 2013.