

Interactive comment on “Temporal stability of soil moisture spatial variability at two scales and its implication for optimal field monitoring” *by* X. Zhou et al.

Anonymous Referee #2

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Temporal stability of soil moisture spatial variability at two scales and its Implication for optimal field monitoring Author(s): X. Zhou, H. Lin, and Q. Zhu

General comments: The authors address the issue of assessing temporal stability patterns attempting to improve capturing and understanding of soil moisture dynamics. The authors apply their concept to a 7.9 ha study site. They also state that such temporal stability concept might help developing optimal design for field monitoring.

Obviously, the authors put a lot of work and effort into the experimental work and also

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in writing this manuscript which I definitely would like to acknowledge here. I'm totally aware how much efforts are needed to get a paper written. Unfortunately, the paper is in some parts very repetitive. I'm not entirely convinced whether the findings as they stand so far are worth publishing in HESS. Its certainly a valuable contribution to the field of how best capturing soil moisture variability, although the complexity and variability in soil moisture is nothing new. However, the statement that this might provide insights regarding hydrological processes seems to me a bit exaggerated especially as I get the impression that the authors are not really clear about what they understand as "hydrological processes".

This is not meant at all criticising this method in itself, I simply find the application of this method, i.e. the evidence for its transferability, is missing. Also it would be beneficial for this paper if the authors would provide some ideas for a way forward. The paper would have benefited significantly from such a discussion.

The method might provide A WAY FORWARD, but if so, please give more detail information which insights into hydrological processes (flow paths distribution, transit times, runoff sources etc?) might be gained. The whole manuscript contains a lot of statements which are generally true and correct, but here either taken totally out of context or there is no evidence / basis for their findings within THIS study and conclusions given. In my opinion, what is missing is an overall context, this method alone seems to be too weak for a scientific journal paper.

It also seems to me that a lot of terminology needs to be clearly stated and clarified to be able to distinguish between terms used in soil physic science and in catchment hydrology (just few examples: catchment, response to rainfall input, hydrological processes, contribution area). Another general comment is that in my opinion the cited literature needs to be largely extended. Please cite additional relevant literature (e.g. a number of aspects/issues are mentioned which are discussed in length in hydrological literature, but not listed/cited here). In addition, some references are cited a bit too often (my point of view), e.g. Grayson and Western, 1998: 8 times!, Lin, 2006: 9 times).

I believe that their studies are very relevant studies, but how does this study adds to their findings?

If the editor decides the study provides valuable contributions to the scientific community I would still like that the following comments, which I outline below, are addressed and the transferable value of this study is expanded.

Following, I answer some of the specific aspects:

Does the paper address relevant scientific questions within the scope of HESS? No

Does the paper present novel concepts, ideas, tools, or data? In parts

Are substantial conclusions reached? No

Are the scientific methods and assumptions valid and clearly outlined? No, see specific comments

Are the results sufficient to support the interpretations and conclusions? No, see specific comments

Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes

Do the authors give proper credit to related work and clearly indicate their own new/original contribution? No, see general comments.

Does the title clearly reflect the contents of the paper? No, see specific comments

Does the abstract provide a concise and complete summary? Yes

Is the overall presentation well structured and clear? In parts yes, in parts not, see comments

Is the language fluent and precise? Yes, though I think some terminology clarification is needed.

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Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes

Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? See specific comments

Are the number and quality of references appropriate? No

Is the amount and quality of supplementary material appropriate? No

Specific and technical comments:

Title:

I don't see that the manuscript suggests and discusses real contributions towards "implications for optimal field monitoring" (at least I expected more reading this title). Hence, please change to "Temporal stability of soil moisture spatial variability at two scales"

Abstract:

P. 1186, L. 18/19 (Last sentence): what kind of hydrological processes? Sources of runoff? Flow paths?, please see also my general comments.

1. Introduction:

P. 1186, L. 22. Please define clearly what is meant in this study with "catchment scale". I get the impression there is a terminology problem and a clear definition is needed.

P. 1187, L. 16/17: not sure about this statement that hilltop soils are usually drier than valley floor soils. There a number of catchments which are characterised by (very wet) peaty gleysols on hilltops. Hence, either take generalised statement out or be more precise.

P. 1187, L. 20. Another example for a very generalised statement which I think I simply can't agree with. "distributions of soil types and landforms are among the first order

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controls of soil moisture dynamics (YES THIS MIGHT BE TRUE) and landscape hydrologic processes” In its core this statement is of course true but hugely simplified. If so, then catchment hydrology would be so easy. Please consider and discuss the complexity in “landscape hydrologic processes” and their distribution. This might lead you to your specific problem which you are focussing on within this study - as ONE of the controls, i.e. variables which might help improving our understanding of such landscape processes.

P. 1188, L. 20: define more clearly what is meant with catchment and swale scale. To put study into context with other work/ catchments.

2. Materials and Methods

P1189, L. 2 include “by field observations”

P1189, L.19-23: Please use international soil classification (e.g FAO) as Rushtown, Weikert etc. might be not clear to an international readership

P1189, L.24/25 “77 sites were selected”: please provide more details and rationale behind selecting particular sites.

P. 1192, L. 6: “IDW provided the smoothest map” Should this be a scientific reason for choosing this method? Please give advantages / disadvantages of other interpolation methods, decided on the ground of scientific reasons. Otherwise, how did you decide which method resulted in your “smoothed” map? Any performance measures/criteria? Please also discuss whether interpolation is actually valid and how this might influence capturing the “spatial variability”.

3. Results and discussion

3.1 Temporal stability distribution across the catchments

P. 1192, L. L18: “has large contribution area” how was this determined? How do you know this?

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P. 1192, L. L18/19: “appears to have quick response to rainfall input” again, how do you know this, how was this determined, are there any input-output relationships which allow you to make such statements? Please give evidence for this.

P. 1192, L. 26: “date not shown”: WHY?

3.2 Temporal stability at two spatial scales

P. 1193, L. 7: “geometry of a catchment ” there is literature published where this issue is widely (and in parts controversially) discussed. Cite (and consider) relevant literature for your statement.

P. 1193, L. 9/10: “swales might provide a meaningful physical base in the temporal analysis of catchment hydrology”. This is another example where a “big” statement is made which is in its core not wrong but as it stands so far, it is exaggerated. Firstly, cite relevant literature. Secondly, catchment hydrology would be so easy and all problems solved

P. 1194, L.2-5. “As a result, a few sites covering the basic topography and soil variations” I don’t agree with this statement- at least not (again) - as the statement stands so far. How would you know what’s your “basic” topography or soil variation? What is your rationale? Which results (table/Figure reference???) lead you to this conclusion?

3.3. Role of soil distribution in

P. 1194, L. 18: correct to Vachaud et al.

P. 1194: L. 18-23: This para is in large parts method description.

P. 1194, L. 18 : “In a catchment with heterogeneous soil distribution ” Is not every catchment (at least at “catchment scale”) characterised by such heterogeneity?? This is a good example, how scale dependent the whole approach and results are, hence the need to discuss this in full length (see some comments above).

P. 1195, L. 3: “clearly the choice ” rephrase (rationale for being “clearly”)

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3.4. Influence of wet-dry transition

Generally: please check whole text about consistency of terms “stable” “unstable” “time-stable” “less-stable” etc. This is very confusing and difficult for reader to follow.

P. 1195, L. 28: “caused by SOME hydrological processes ” Are the authors clear about what “hydrological processes” are? Be more specific!

3.5. Implications of temporal stability

First whole para: what is this para about? Is this introduction?

4. Summary and conclusion

P. 1198, L. 22 (“suggesting that the swales may be viewed as a miniature of the whole catchment ”) and L. 26 (“for a catchment with heterogeneous soils and landforms ”) This is in my point of view a totally contrary statement (and in a way reflects the problem I have with the whole manuscript) Is the catchment heterogeneous? (yes, most / all catchments are). How can we assume than one landform / unit as a “miniature” of the whole catchment, especially as soils/landforms are different?

P. 1199, L. 12 “with a clear purpose ” shouldn’t this be a prerequisite for all field monitoring and experiments???

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 1185, 2007.

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