

## ***Interactive comment on “Analysis of surface soil moisture patterns in agricultural landscapes using empirical orthogonal functions” by W. Korres et al.***

### **Anonymous Referee #1**

Received and published: 7 October 2009

#### General comments

The authors apply principal component analysis (PCA) to repeated soil water content measurements in two test sites. The data sets are of good quality and I only see sound scientific work. However, main criticism is on the scientific construction of the manuscript. It lacks from a clear rationale. Why is this PCA method applied to this specific data set? And what do we expect to learn from this? The statement of relevant goals is clearly missing. Thus, major revisions are required. Further, the conclusion section is rather weak due to the lack of clearly stated goals. The written English requires improvement. I made some suggestions, however since I am not a native speaker either, I suggest some serious editing by a native speaker.

specific comments

5566

7 skip "land" and add "both" before "within"

9 replace "dates" with "measurement campaigns"

12/13 replace "connect" with link and replace "related factors and processes" with "variables"; it is not possible to measure factors and processes, you can only measure variables and assume that those variables are linked to a certain process.

20 replace "connected" with "linked"

22 replace "more" with "stronger" and replace "on" with "at"

5567

2 replace "it affects the partitioning of" with "partitions"

11/12 please skip the last part of the sentence following the reference

18-20 skip the sentence "However, ... complex." That depends on the scale you are looking at.

23 please add "can" before "play"

24 add the reference to Herbst et al., 2003 (Modelling the spatial variability of soil moisture in a micro-scale catchment and comparison with field data using geostatistics, Physics and chemistry of the earth, 28:239-245) after "role"

29 replace "diminish" with "override"

5568

1 replace "greater" with "larger"; But this is not the whole story. Under very wet conditions variability in soil moisture probably decreases, see "Explaining soil moisture variability as a function of mean soil moisture: A stochastic unsaturated flow perspective"

C2295

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by Vereecken et al., GEOPHYSICAL RESEARCH LETTERS 34(22); "seem" instead of "seems"

2 add "a" before "1.4 ha..."

12 see comment to line 1!

14 replace "greater" with "larger"

15-23 skip this section on auto-correlation length, there is no link to this manuscripts scope

5569

7-10 This is probably the weakest point of the manuscript. The first goal is actually just the method you applied. The second goal is rather weak. What is the purpose of applying EOF here? You do not really want to check the potential of this method. In that case it should be compared to similar methods. So, what is the rationale? E.g. could this be used to optimise ground truth sampling design for comparison with satellite data, or to identify auxiliary variables helping to explain the patterns... . I suggest to pinpoint 2 or three goals, which could be reached looking at the results presented here. And you should refer to this goals in the conclusion section.

12 skip "in the framework...project"

14 add ", Germany" after "Cologne"

16 replace "rolling" with "hilly"

17 add "were" after "Measurements"; skip "to the"

22 replace "greater" with "higher"; those bulk densities are incredible low, sure there is no error? This must rather be a bog than a mineral soil.

5570

1 add "located close to Selhausen, Germany" after "area"; replace "slight" with "gentle"

C2296

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6, C2294–C2302, 2009

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14 "typical"? better use "average"

16-18 skip this lines, irrelevant

24 is this precision of +-1% from literature? If so, please give the reference.

25 replace "evaluate" with "investigate"

26 why was the soil sampled at 0-10 cm, whereas soil water content was measured for 0-6 cm?

5571

8 bulk densities are already given (5569 line 22)

12 skip "Also here"

13-15 skip this sentence, irrelevant

21 How accurate is that visual estimation of the coarse fraction!?

5572

8-10 skip this sentence, irrelevant

5574

4 better use "Selection of EOFs" as section heading

20 replace "rules" with "methods"

5575

5 replace "rules" with "methods"

14 skip "additionally"

16 replace "rules" with "methods"

22 replace "measuring points" with "measurement locations"

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26 replace "days of measurement" with "measurement campaigns"

5576

1 skip "Thus,"

3/4 replace "the number...pairs" with "those sampling pairs within the spatial auto-correlation range were excluded from further analyses"

5-7 This assumption is not valid. For example the paper of Vachaud et al. (1985) clearly demonstrates the temporal persistence of soil moisture patterns in time.

The section between 5575 line 26 to 5576 line 5 should be moved to the results section.

9/10 Here you find a potential goal!! "To estimate the dominant drivers governing the surface soil moisture patterns" I just suggest to replace "estimate" with "identify"

19 skip "(lateral)", "horizontal" is clear enough

19/20 you better distinguish between local and non-local controls than between "horizontal" and "vertical"

25 skip "an"

27 1:50000 is a very coarse scale. You better use a pedotransfer function cause texture and bulk density are measured on-site.

5576 line 28 to 5577 line 1 skip this sentence, redundant

5577

6 replace "interrelated" with "correlated"

7 skip "thus"

15 Isn't that statement contradicted by a CV of 9.6% versus 14.2%? Variability is 50% higher, and that despite lower slopes in the arable site.

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25 add ", which is located in the lowest part of the catchment." after "...test site"

5578

5 replace "days of measurement" with "measurement campaigns"

7 may be there is a blank in "17124"?

13 replace "called henceforth" with "referred to as"

20 move "positive" before "values" and skip "signs"

5580

6 replace "parameters" with "variables"

7 add "variables, which allow to reason" before "driving"

5581

6 usually "r" is used for a correlation coefficient instead of the capital "R"...

8 please write"... clear link to"; "vertical process" and local control, what is probably more relevant.

10/11 please write "This pattern is also linked to catchment topography"

11 "strong"?? Even -0.57 indicates just moderate correlation. Everything below 0.5 indicates weak(or no) correlation.

16 add "which" before "affects"

19 replace "on 13 dates" with "at 13 campaigns"

5582

3 replace "over" with "more than"

4 skip "here"

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8 move "physical characteristic" before "most"

15 replace "study agrees" with "findings are in line"; skip "in" before "that"

5583

1 replace "functional" with "working"

3 replace "meaning" with "indicating"

9 skip "values"

15 replace "subordinately" with "to a lower extent"

16 please write "while our first EOF is rather related to soil properties than to landscape position."

18 add "of the" before "previous"; replace "working" with "at"

19 replace "looked at" with "investigated"

20 skip "land"

21 skip "land"

25 please write "...at an elevation of..."

28 replace "underline" with "point at"

5584

1 replace "judged" with "seen"

9 please add "%" after 0.6

12 skip "exemplarily"

15 skip "much"

17 skip "pattern"; replace "be fully reversed" with "turn around"

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18 replace "filled" with "almost saturated"

20 replace "are" with "were"; replace "shortly" with "just"

21 replace "are" with "were"

24 replace the parenthesis with ","

25 replace "in" with "of"; replace the parenthesis with ","; skip "the"

26 add "being" before "covered"

28 skip "both"

5585

1 add "i.e. the" after "("; replace "," with and

2/3 replace the parenthesis with ","

3/4 another goal?

5 replace "reversing" with "alternating"

6/7 replace "makes it possible" with "allows"

9 replace "great" with "large"

20 replace "It" with "This"

24 skip "and SOM", SOC and SOM means the same; what is the link between SOC and Stagnosols?

26/27 what is the explanation for that?

5586

2-4 Was that the question?

4-5 replace "an avenue" with "the opportunity"

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5587

1 replace "objective" with "empirical"

3-8 skip, this is not a conclusion drawn from the results of this study

5593

Fig.1 replace "field borders" with "land use boundary", skip "in Western Germany"

5594

"indicates" instead of "indicate"; replace "count" with "number"

5597 The numbers in the legend are almost illegible, increase font size!

Why are no colours used for the figures? This would surely enhance the accessibility of the patterns. Publication costs are the same?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 5565, 2009.

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6, C2294–C2302, 2009

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