

# ***Interactive comment on “Monitoring hillslope moisture dynamics with surface ERT and hydrometric point measurement: a case study from Ore Mountains, Germany” by R. Hübner et al.***

## **Anonymous Referee #1**

Received and published: 2 July 2014

The paper presents new data from a small study site in the mid hills of eastern Germany. It combines an electrical resistivity timelapse survey with 1D hydrometric data using tensiometers and FDR sensors in order to improve the special prognosis of water content/movement.

General comments according to HESS review criteria:

1. Does the paper address relevant scientific questions within the scope of HESS?

The questions addressed in the paper are interesting and relevant for many studies in the field of hydrology and they surely are within the scope of HESS.

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## 2. Does the paper present novel concepts, ideas, tools, or data?

The paper presents a combination of well described and widely used methods, thus not really new. However in the context of slope hydrology in Pleistocene periglacial cover beds this combination of methods is not widely used and could result in interesting new data and concepts. Parts of the data/results are a slightly modified version of previously presented data in Moldenhauer et al. (2013) such as figure 8. See also comments point 3

## 3. Are substantial conclusions reached?

This is my biggest concern of the whole study. Besides some concerns with the presented data and the methodology (which can be addressed in a revised version) a continuing discussion and conclusion is missing. Very often the authors describe/discuss details of their data but the methods itself aren't new. In a revised version the authors must find a way to either completely focus on the novelty of their approach and methods or (recommended!) to show the reader the consequences of their findings. What can we learn from this study in order to better understand hill slope hydrology in general, where are the clear benefits of your approach compared to others, are your results valid for al mid hill regions (I doubt) etc.

I could imagine producing tables to compare key outcomes of their investigation with other studies in order to document and further discuss the benefits against other work. In its current version it is another case study on hill slope hydrology of a very small study site – yet with very detailed high quality data – not giving too much new insight on the hill slope hydrology problems.

## 4. Are the scientific methods and assumptions valid and clearly outlined?

In general the used methods are appropriate and well documented. The research team has a profound knowledge and background to address the topic and the partly do it in a detailed, professional way. Specific issues concerning the methods are raised further

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below.

5. Are the results sufficient to support the interpretations and conclusions?

The results are indeed sufficient to support their conclusions, however, as said above, the conclusions are not very substantial and need to be revised.

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

In general yes, specific issues see below.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

Yes, however if the conclusion changes, there needs to be an extension of works from other countries.

8. Does the title clearly reflect the contents of the paper?

As large parts of the study site show complete saturation as indicated in figure 8, the question arises if hill slope moisture dynamic addresses this issue correctly. I suggest adapting the title.

9. Does the abstract provide a concise and complete summary?

No, the abstract clearly needs restructure. It also needs to include some of the results in detail. At the moment the results are only addressed in vague descriptions, give some numbers as you have them. A concluding sentence is missing in its current state.

10. Is the overall presentation well structured and clear?

The material and methods section can be restructured. It is not clear why 2.2 (Hydro-metrical equipment) describes sampling frequency? It is not fully clear why hydrometry is not under monitoring since the authors take measurements since years

11. Is the language fluent and precise?

C2172

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Yes for most parts, but it needs some corrections here and there.

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

Yes, this is a clear strength of the paper.

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

Yes, some figures (see specific comments)

14. Are the number and quality of references appropriate?

Yes, but compare point 7.

15. Is the amount and quality of supplementary material appropriate?

Yes

Specific comments

5860/1 ..are one of the basic units. . . which ones else?

5861/18 Ad-hoc discusses a 4th late Pleistocene layer – do you have it in the study site?

5861/19 it might be important to know the LB often contains multiple layers!

5861/22 . . .influence in which way? Unclear

5862/8 Hydrogeophysical. . . Aren't these geophysical methods applied in Hydrology? Hydrogeophysics uses hydrological, geophysical or sedimentological methods.

5863/2 . . .still uncommon. Really, I don't agree, there are many studies nowadays. You might need to further look into the literature.

5863/3 . . .non-invasive. . . . no, it is invasive but at a low level. Your electrodes punch

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the surface, in Archaeology for example this would be severe!

5863/12 ...approx. 7.... Be precise a mean slope angle doesn't tell the reader anything ! Also do you mean average?

5863/19 ....low bulk density. .... be precise, avoid low/high, as compared to an Andosol a bulk density of 1.2 g/cm<sup>3</sup> would be high.

5863/23 ....parallel to the slope. In which way? Long axis along or across the slope (both is parallel)

5864/8 ....resistivity... I suggest you should use the terms apparent/specific ELECTRIC resistivity, just as you do in line 14 on page 5864.

5865/5 how was the saturation achieved, from below by suction or from above by infiltration? Also the gravel content is >50% in LB, how could this fit in a 3.6 cm diameter tube, LBs in igneous rocks often tend to have be larger stones incorporated? Could this be a major fact for some of the later observed variability?

5866/11 Because.... why because? Unclear (did you test or assume?). Often roots trace the depth of the layers very nicely. The question is do you have a high enough spatial resolution in your survey. A 1 m spacing does not give you a 10-20 cm vertical resolution as you want to resolve the LH and LM. Please indicate the vertical resolution of your arrays and settings.

5867/3 15cm deep electrodes will further reduce the vert. resolution on the top a lot! In theory you should a point on the surface.

5867/8 including temperature correction is really good and rarely done

5967/22 use (i), (ii), (iii)

5868/1ff contact resistance wasn't measured, why? Could this influence the data?

5869/10 so there is no influence of a frozen LH during winter?

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5869/27 ...may not be differentiated. ... But it could be also due to the too low vertical resolution of your survey design?

5870/19 ...may vary. To what extent?

5871/20 would this also be the case with a higher resolution in your survey design?

5872/11 the reader wants to see a detailed 3D map of the layers in order be able to judge this statement.

5874/2 you don't have a 0.2 cm resolution!!! Be careful

5876/7 ...infiltrates to the upper ... what do you mean the upper layer (LB) or the upper part of the LB?

5876 ...remain low. Be precise what does it mean?

5877/23 or with higher resolution?

5877/LB can't have electric characteristics only the sediments within LB.

5878/3 pedophysical. .... is this the right term? You didn't talk about pedology yet about sediments. Earlier you used petrophysical – did you mean this?

5878/4 did you really derive a method?

Table 1 bulk density can't be in % must be g/cm<sup>3</sup> ? Need to know the number of samples used to develop this table (assume it was not only 1 sample?)

Table 2 same as for table 1 "n" needed

Table 3 need explanation of F<sub>AE</sub> and n<sub>AE</sub> in caption

Figure 1 source of left fig? DEM? Need coordinated, Ger outlines not known to all readers, need explanation

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