## General comments

The paper deals with the use of Electrical Resistivity Tomography (ERT) to show a pattern of soil structure and water dynamics in a study case in Germany. It describes the experimental device over a small spring catchment, including water content probes (5), tensiometers (76), suction cup (10) and electrodes transects (7). 27 ERT measurements have been performed from May to December 2008. The Archie's relation has been calibrated in laboratory, from 15 undisturbed soil samples. ERT were finally used for comparison with both water content and soil tension data, and 3 examples of rainfall are interpreted in terms of water fluxes through the subsurface.

Several aspects of interest can be pointed out. The hillslope scale is indeed a crucial scale for the understanding of the hydrological processes, and must be more investigated. Here, the results give an interesting pattern of the soil water dynamics, integrating a first level of spatial variability. Although this approach is not really innovative, it will help modelers in the choice of their process hypothesis. Another point of interest is to show the robustness of the ERT approach to give valuable information on the structure and the water content distribution in the near subsurface area. This kind of study is thus expected to produce original and useful information within a robust methodological framework. Concerning the interpretation of the subsurface fluxes, the study remains qualitative, and more quantitative results could be obtained furthermore, e.g. the estimation of the hydrodynamical characteristics of the soils by inverse modelling from the ERT or from the tension measurements.

The paper is rather well-written and structured. The state of the art is correct, and the bibliographical references give a good overview of the use of ERT. The presentation of the materials, methods and results is generally clear and concise. However, as suggested in the following comments, corrections and complements are required for improving i) the description of both the experimental device and the protocol of measurements, ii) the process of ERT and their reliability, iii) the interpretation of ERT in terms of water content or fluxes.

## Specific comments

### Experimental device

The information given for the measurements is sometimes Insufficient, especially for the deepest layers of the sub-surface. How was measured the porosity, how many samples? Which depths and which method? What is the maximal sampled depth? How was estimated the porosity is the deepest layers? Concerning the pore soil water, what is the temporal variability of the measurements? In general, the mean values in the Tab.2 and Tab.3 should be associated at least to standard deviation or appropriated measures of dispersion in order to show the spatial or temporal variability.

As drilling has been performed down to 4m deep, it would have been very interesting to put one or several piezometers in order to get more accurate information of the deep water dynamics or constrain the inversion model.

### ERT processing

The vertical resolution in the top layers of the soil (0.20m) seems to be incoherent with the spacing between the electrodes (1m). Could you justify?

The calibration of the Archie's relation in laboratory proves to be satisfactory for the $n_\Theta$ parameter, and the relation between $n_\Theta$ and the grain size distribution is a nice result. How could you interpret the fact that $F\Theta$ remain constant?

The values $n_\Theta$ and $F\Theta$ should be compared to the expected values from the literature or from values coming from other similar studies.

The derivation of the water content from the electrical resistivities supposes that you consider $F\Theta$ and n constant, from the depth 0.9m down to much deeper. But there is no evidence that it would be the case, because the maximal depth of the core soil samples used for the calibration of Archie's relation does not exceed 1.4m. Why do you show the ERT below 3m deep (Fig.7 and Fig.8), whereas the layering for inversion is said not to exceed 3m (5868, 17). I suggest that depths should not be considered deeper than the bottom of the basal layer.

ERT uncertainties should be presented more in details: by comparing the values of the electrical resistivities at the nodes of the electrode lines; - by associating standard deviations to the mean values for example (Tab. 2, Tab.3, …); by giving more information about the temporal variation of the pore water resistivity, over the monitoring period.

Interpretation

The estimated ERT water contents are only compared to the measured Theta Probe water contents and the measured tensions at the H3a profile. This comparison should be extended to all the measured tensions. The calibration of the relation between pressure and water content would allow optimizing the comparison between both electrical resistivities and water content.

5879, 24-27: I'm not convinced that ERT could deal with the small-scale heterogeneity like preferential flows, due to the size of macro-pores or corresponding channels. I suggest that the phrase should be removed.

In conclusion, although there are no innovative results or methods, I consider that the main objectives of the paper could be of interest for publication in HESS, but I recommend major revision of the presentation of the experimental device as well as the process and interpretation of the ERT.

In addition, some technical corrections should be made.

5864, 7 : characteristics of the rain gauges ?

5865, 12 : change $\delta_{w25}$ in $\rho_{w25}$

5866, 6 : change \ A102.5°, \ B90° in \ A102.5°, \ C90°

5866, 19 : what does 0.195*L* refer ?

5870, 1 : remind the number of samples → Figure 4 shows the aggregation of the single 15 samples into two regions with different

5871, 27 : “inner” and “outer” areas should be defined before 5871, 3 because it appears in Fig.5. The definition remains unclear.

5891, Tab.5 : change $\Theta_{H3a}$ in $\Theta_{\rho H3a}$, to be coherent with the notation in the line titled “Depth”

5892, Fig.1 : displays 37 tensiometers, when the text mentions 76 (5864-2)

5894, Fig.3 : the figure shows 14 points for each grain size, whereas there are 15 mentioned samples in the text

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