

Interactive comment on “Non-stationarity of electrical resistivity and soil moisture relationship in heterogeneous soil system: a case study” by D. Michot et al.

Anonymous Referee #2

Received and published: 19 October 2015

The manuscript describes an ERT time series on toposequence with a hedgerow and analyses soil structure and developments in soil moisture in combination with concurrent piezometer and tensiometer data. The data are interpreted mainly in relation to the effects of the hedgerow on the soil system. I do recognize that collecting concurrent ERT and tensiometer\piezometer measurements in a temporal sequence is very involved and may render duplication infeasible, but because the manuscript only covers one transect there are serious limitations to judging the consistency and validity of any of the interpretations and conclusions.

The methods of data collection and analysis are thorough and are well covered in

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the manuscript, if anything these parts are a bit long and some descriptions can be shortened to make them a bit more to the point. The double goal of the paper (establish relations between ERT and water, and interpret the hydrological effect of a hedgerow) make this paper long and quite hard to understand because a clear line is missing. The experiment design is somewhat in the middle of both objectives making the results hard to interpret.

The writing and figures are not particularly clear and I find some of the interpretation\discussion point and conclusions weakly supported. Below some specific issues are addressed, but revisions are required more generally to improve the readability of the manuscript.

Fig S1: representing depth on the x-axis of a graph is kind of hard to read and also different from all other figures in the paper, consider changing this.

3. Results: I find this section very hard to read as many things are mentioned in the text, but it is unclear why which information is relevant and how it links to any of the questions.

Sect 3.1: I am unsure of the interest of this section as it is not much in any of the further results and conclusions. The take home message that the year was wet could be outright stated (maybe with the numbers for precipitation or net rainfall against the normal)

Fig2a: it would be more logical to plot PET as negative and Precipitation positive so their axes and plotting position/direction conforms with the net rainfall figure Fig2b: because the periods between ERT observations are irregular it is illogical to summarize the net rainfall to those period (especially for the other years). I would advise to summarize rainfall to regular (monthly or biweekly?) periods. . .

Fig 3: There are too many lines in this graph to tell them apart, even when enlarged on the digital version

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Fig4: The differences between the 10 sub-figures are minimal and near impossible to see or interpret in a meaningful way for the reader.

Fig 5: the small graphs showing the changes are good, but the placement around the coloured section out of order makes this figure hard to follow. Separating the graphs from the cross section and presenting them in order would help.

Fig S4: The interpolation of metric potential in these figures is really off. It would be expected to be more layered with less fitting to the mean (am I right that there are only values measured at the crosses?). Also I would not expect to see large negative potentials under the groundwater level

Fig 6 (and text): How is the top soil layer defined? Throughout the manuscript there are a number of mentions of top soil (or topsoil) layers it is unclear which is used here

Fig 8: the Waxman and smit model represents a curve function and should thus be represented as such as is essentially independent from available observations. Why is it shown as points in this figure?

Discussion: 4.1 l10-15: I think this interpretation of the information in the ER inversion is very farfetched. It can very well be an effect of the roots themselves on ER, an inversion artefact or something else. There is not enough data to support any interpretation in this case.

L25 – 30: It seems likely that this low resistivity zone is related to saturated soil, but I do not get how high hydraulic conductivity and infiltration rate play a role in this, there does not seem to be data to support this interpretation.

4.2: p973L15 –p974L10: the precision in the root system description does not reflect the inherent uncertainties in an ERT system; I do think that these interpretations are insufficiently supported. 4.3 L25: The ER for up4 seems to be almost constant over the whole period. it is hard to see this as a shift from one group to another

4.3 and 4.4: The main problem here seems to be that three different models are used

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which contradict each other. 1: It is clear that the relation between ER and matric potential is not constant (different in T06 and T10, fig 7) 2: The relation between VWC and matric potential is assumed constant (van Genuchten model). Therefore 3: No single set of Waxman Smit parameters can be valid as it links 1 and 2 together. > The most likely reason is that especially in the presence of clay, ER and soil water are not uniquely relatable. Possibly this is in some way addressed in fig 10? But this figure is not discussed or referenced at all in the text.

Conclusions: L6-8. ERT rather reveals the combined effect very easily, but individual contributions are more difficult to consider. . .

P977 L 19: the conclusion section is no place for assumptions.

Interactive comment on SOIL Discuss., 2, 955, 2015.