

## ***Interactive comment on “A mechanistic model for electrical conduction in soil–root continuum: a virtual rhizotron study” by Sathyanarayan Rao et al.***

### **Anonymous Referee #1**

Received and published: 16 July 2018

#### General comments:

The interesting article “A mechanistic model for electrical conduction in soil–root continuum: a virtual rhizotron study” deals with the impact of roots on the derivation of soil water content from electrical conductivity derived from ERT inversion. It shows the impact of maize roots in a modelled rhizotron on ERT inversion results on different scales. In general it is well structured and understandable, although it would profit from corrections of an English native speaker (especially in terms of singular/plural, articles and prepositions) (I’m not a native speaker but tried to mention at least some errors in the detailed list at the end of this review.). The paper addresses relevant scien-

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tific questions and presents results that help to understand these. Therefore I suggest publication after some changes.

#### Specific comments:

The conclusion is very long and is more a discussion of the results than a conclusion. In my opinion it would be better to split this section into a discussion and a short conclusion. Another factor that is not discussed at all is the impact or error of the wrong pedophysical model. In a real field example, where one would measure ERT, take into account the roots and tries to derive the water content, the pedophysical model, i.e. Archie’s law, Waxman-Smits, effective medium models, ... greatly influences the derived water content. That means even if you take the roots into account (which of course is an important factor) your derived water content could be wrong depending on the model. Is it possible to say if the error induced by the wrong pedophysical model is larger or smaller than the error of taking roots into account? Even if this cannot be quantified, this point should be added to the discussion.

#### Technical corrections:

##### Abstract:

Line 21: change "translates" to "translate"

Line 22: change "shows" to "show that"

Line 23: change "behaves" to "behave"

Line 27: change "explicitly accounted" to "explicitly accounted for"

##### Introduction:

Line 48: delete "particularly"

Line 52: change "relationships" to "relationship"

Line 53: delete "method"

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Line 59: change “dependent to . . . also to” to “dependent on . . . also on”

Line 98: change “orange orchards field” to “orange orchard fields”

Line 101: change “ERT result” to “ERT results”

Line 110: change “using” to “using an”

Material and Methods:

Line 128: change “in” to “of”

Line 173: delete the , before the .

Line 194: change “refer sig\_bulk\_soil” to “refer to sig\_bulk\_soil as”

Line 200: change “problem” to “problems”

Line 225: change “First” to “Second”

Line 232 until the end of the paragraph: I do not understand what you did exactly and why you did that. Please clarify.

Line 247: Please check if the order of figure numbers is appropriate. Figures 5 and 6 are only mentioned in the results section.

Line 256: change “to account” to “to account for”

Lines 240-264: From my point of view these paragraphs already include some results (e.g. Figure 7). Please check if you could clearly separate the methods from the results and move the results into the appropriate section.

Results:

Line 275: change “accounted” to “accounted for”

Line 293: should the “-“ between the conductivities be a “<”?

Line 311: Please check the grammar of this sentence. The meaning is not clear to me.

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Line 353: What is meant with “They”? I do not understand the following sentence and especially the content in the brackets. Please clarify.

Line 361ff: It is not exactly clear if the contrast between roots and soil is low or if the conductivity of the roots is low. Please clarify.

Line 377: The age unit is missing (age <10 days).

Conclusion:

Line 391: If a reader is only reading the conclusion it is not clear what eq. 2 is. Maybe it would be better to call it Archie’s law or Waxman-Smits equation. Please consider if you could use this nomenclature also in other sections when you refer to eq. 2. This would probably increase the readability of the text.

Line 393ff and also following paragraphs of the conclusion: This is more a discussion than a conclusion. Please consider to split this section into a discussion and a short conclusion.

Line 411: delete the “;”

Line 423: What is meant by “them”?

Fig. 7: The difference between the symbols for arithmetic and harmonic mean is not clear to me (in 7b and 7d). The same applies to the symbols in c and e. Maybe also another colormap (e.g. jet) would be better in b and d.

Tab. 2: Maybe a figure would be easier to understand than this table.

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