

Dear Editor and Reviewer,

We appreciate your constructive comments and thank you for accepting our manuscript with minor revision. Please find below detailed reply to your comments.

1.1 The revision of hess-2016-299 is a good improvement compared to the original submission. The materials and methods are now clear. Conclusions are adequate and supported by the results. All responses to my comments and to the Editors's comments are adequate.

Reply 1.1:

We acknowledged Editor and reviewers comments on our previously revised manuscript, which improved the quality of our manuscript.

1.2 I have just one note. In my original report I commented:

1.9: L239 here's my only methodological issue with this paper. You use as nonconductive scenario a soil that is completely dry. (By the way, what are the salinity values measured at this site? E.g., the conductivity of the saturated paste extract?). In their protocols for use of apparent electrical conductivity measurements in agriculture, Corwin and Lesch state that the soil volumetric water content should be at least 50% of the value at field capacity (ideally between 70% and field capacity. Otherwise, the liquid pathways of electrical conductivity through the soils would be interrupted, unpredictably increasing the resistivity of the soil. This is very likely reason why your results on the non-conductive scenario are not encouraging. My criticism is the following: with one scenario where EC_a is known not to be reliable, is the other scenario (highly conductive medium) enough to provide context to your data analyses? I fear not. I think this paper would make much better of a point if other scenarios (e.g., increasing water contents?) were presented. See: Corwin, D.L., and S.M. Lesch. 2013. Protocols and guidelines for field-scale measurement of soil salinity distribution with EC_a-directed soil sampling. *J. Environ. Eng. Geophysics* 18(1):1-25. and: Corwin, D.L., and S.M. Lesch. 2005b. Characterizing soil spatial variability with apparent soil electrical conductivity: I. Survey protocols. *Comput. Electron. Agric.* 46(1-3):103-134.

Authors responded:

Reply 1.9: We thank the reviewer for highlighting this important issue. For the same site, Jadoon et al. (2015) reported a relationship to relate bulk electrical conductivity to the soil salinity (i.e., the conductivity of the saturated paste extract). Observed soil salinity range between 3-185 dS/m). As discussed earlier (Reply 1.1), in the revised manuscript same relationship will be used to estimate the soil salinity. Text and Figure C5 HESSD Interactive comment Printer-friendly version Discussion paper 9 will be incorporated to show the soil salinity distribution. Synthetic and field measurements were analysed to test the performance of the electromagnetic forward model in conductive and non-conductive soil, and retrieve soil salinity using Bayesian inversion. In the case of synthetic scenarios, EMI data was generated using electromagnetic forward model and Bayesian inversion was used to estimate five parameters (three layer electrical conductivities and two layer thicknesses). Result shows that the electromagnetic forward model is not sensitive to the non-conductive soil. Similarly, Minsley (2011) used synthetic data considering the characteristics of shallow ground-based EMI system, geophex GEM-2 and reported that the electromagnetic forward model is less sensitive to the non-conductive soil. Indeed, in the agriculture field the soil electrical conductivity decreases if the soil water content is below

50% of the field capacity, which may cause the less encouraging results for the nonconductive soils. This issue will be highlighted in the manuscript and the references of Corwin, D.L., and S.M. Lesch. 2005 and 2013 will be incorporate.

While I am satisfied by this reply, I think I might have missed where this issue was addressed in the revised manuscript.

Reply 1.2:

Text had already been incorporated in the last paragraph of results and discussions (278-285 line) and Figure 9 was included to show distribution of soil salinity. References mentioned in the comment were reported in the introduction of the manuscript.

1.3: Congrats for the very interesting research!

Reply 1.3:

We cordially appreciate your critical comments and the time you invested to review our manuscript. Thank you for your compliments.