EGUSPHERE-2024-1587 | Reply to Referee # 1

Rapid methods for assessment of soil compaction at various spatial scales are much needed and near-surface geophysics is increasingly becoming popular to address this challenge. In this work, the authors compare and contrast the suitabilities and limitations of electromagnetic induction and electrical resistivity tomography methods for assessing soil compaction by considering the spatial resolution and scale aspects. I commend the authors for this valuable contribution towards managing expectations on sensors' efficacy and I believe this article is an excellent fit for the special issue on Agrogeophysics. I suggest the authors do a moderate revision before it can be accepted for publication.

All the best!

General comments:

1. Please refrain from using abbreviations in the title, figure captions and at the beginning of the sentences. Please define abbreviations before their first usage. Also, please use the same terminology for the sensing technology consistently, e.g., replace DC-current with electrical resistance tomography (ERT).
   We checked and corrected the whole manuscript to be consistent in the terminology of the techniques and in the use of abbreviations.

2. The abstract needs to be more focused and highlight the work's unique contribution. Please consider revising.
   Thanks for the comment, we rephrased the abstract highlighting the innovative aspects of the work (LL 14-24)

3. Kindly improve the figures especially Fig. 1 and 2. In Fig. 1, it would be nice to see the location of the insert in Fig. b., also please change "FDR" to "TDR" in the legend. Are the tramlines orthogonal to the seeder traffic? In Fig. 2a, please present the maps in 2D rather than 3D. In the current form, it is difficult to see the ECa variability in deeper measuring channels.
   Thanks for the suggestions. We improved Fig. 1 and its caption (LL 100-103). The tramlines are longitudinal to the field, while seeder traffic occurred transversely, but not exactly orthogonal since they are separate experiments.
   As for Fig. 2, we replaced the 3D visualization with 2D ECa maps referring to each coil.

Specific comments:

Comment	**Reply**
In lines 45-50, "moisture EC-derived content" should be "EC-derived moisture content".	Replaced, thank you (L 49).
In lines 115-120, "Electro-Magnetic Induction" should be "Electromagnetic induction".	Replaced, thanks (L 118).
In lines 140-145, "Cumulative Sensity (CS)" should be "Cumulative Sensitivity (CS)". I think it would also be nice to	Replaced and reference added, thank you (L 145).

include a reference here on the inversion codes based on the CS forward model.	
In lines 145-150, “8 cross-transects”. It would be nice to see them in the Fig. 1.	Actually, the 8 cross-transects are already shown in Fig. 1B at numbers 1 to 4. Being short lines, it is difficult to appreciate them sharply without covering the samples position in the field plot. Therefore, a zoom frame of their arrangement is shown in Fig. 1C
In line 170, “discharging” should be “removing”?	Corrected, thank you (L 171).
In lines 185-190, “The number of homogeneous areas were automatically selected resulting in four clusters”. This statement needs further explanation on what basis. Is it the Elbow method or the Silhouette score?	The number of groups was determined using the Calinski-Harabasz index, which quantifies the ratio of between-group variance to within-group variance, and ensures an optimal balance between group distinctiveness and internal cohesion. Details have been added to the text (L190-191).
In lines 205-210, “Indeed, EC soil properties showed a non-normal distribution.” This sentence needs to be revised. Do you mean you used Spearman’s coefficient because you expect the relationship to be monotonous?	Revised and rephrased, thanks (LL 208-209)
In lines 230-235, “FDR” should be “TDR”.	Corrected, thanks (L 234).
In lines 300-305, Please see if you find any rule-of-thumb to define categories from strong to weak.	We modified the text according to the present correlations categories used as rule-of-thumb: ▪ 0 - ±0.3 weak ▪ ±0.3 - ±0.7 moderate ▪ ±0.7 - ±1 strong (LL 304-312)
In lines 370-375, “In addition, it is crucial to remember that in the presence of a conductive soil, most of the signal at higher frequencies is conveyed, via electromagnetic induction, in the topmost layer, decreasing the depth of investigation.” Do you mean that most of the currents stay within the topsoil and do not diffuse to the subsoil?	Exactly, we rephrased to make it clearer (LL 375-376).