Interactive comment on "Time-lapse monitoring of root water uptake using electrical resistivity tomography and Mise-à-la-Masse: a vineyard infiltration experiment" *by* Benjamin Mary et al.

Anonymous Referee #3

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Review comments on Mary et al., 2019 SOIL This paper by Mary et al., proposed a novel and integrated geophysical monitoring framework to investigate the complex soil-root system, especially focusing on assessing the root water uptake and delineating the active root density. Such multidisciplinary and innovative research should be encouraged and supported as the authors are developing tools to provide quantifiable and potentially spatiotemporal intensive data for SPAC modeling. However, there are few major flaws in this paper that prevent it from publishing in its current form. I suggest the authors redesign the experiment, revise and expand the current manuscript according to the reviewers' comments, and resubmit it. Some general comments: 1. I assume this paper is meant to be an extension of Mary et al (2018) and to focus on infiltration

experiment. However, the datasets presented in this study and the affiliated discussions are not sufficient for a regular full paper, particularly, the lack of linking to any ground-truth data (such as soil samples, soil water chemistry, TDR measurements, rhizotron measurements, and so on). The authors also did not the full advantage of their >24 hours time-lapse measurements, only limited snapshots are presented without quantitative analysis. As a result, it is not convincing that this work has advanced the work from Mary et al., (2018), yet exhibits problematic overlaps. 2. In both current study and Mary et al., (2018), the biggest technical issue is that the electrode spacing is too small (0.1 m) and this might have violated the point-source assumption. The authors didn't explain what the electrodes they were using, or how deep the electrodes were buried in the ground. But from Figure 1 in this paper, it seems like authors used standard stainless steel electrodes with at least 10 cm into the ground (equal or even greater than the electrode spacing) This is extremely important as the current course in such setup (electrodes too close to the target and experiment dimension is on the same order as of the target) is very likely not 'point-source' anymore, and the noise could overwhelm the actual data due to target property changes. Such electrode mislocation errors can be very complicated but can be simulated in synthetic experiments. Furthermore, due to the principle of reciprocity, such data error cannot be caught and eliminated by reciprocal measurements. There are few studies on this problem and I strongly suggest the authors read related literature. I personally had failed experiments before due to this very reason. 3. The results and discussion are too brief and qualitative to provide an in-depth discussion on how the ERT and MALM reveal the actual root functions. For the readership of this journal, the actual root-soil mechanisms that were revealed and supported by geophysical methods are very appealing. The authors did a time-lapse (>24 hours) experiment, why the time-lapse ERT resistivity changes or MALM results are not shown? Only the initial condition and 2-hr snapshot are shown? More time-step data would provide significantly more information into the root system function. 4. More detailed soil information and geophysical survey design information should be provided. 5. An illustration showing the borehole locations is very necessary.

Also, please label the borehole number in the geophysical results plots as well. 6. Figure 5 shows the normalized voltage ratios for plant B, but this figure was not discussed or mentioned in the manuscript. 7. Figure 7 and the corresponding text section 3.4 are difficult to follow. First, where is the boundary of this estimated active root zone? What are the exact times from T1 – T5? Are these boxes representing all the ER values outside and inside the zone? Or just selected values? 8. Line 150. It is not very clear what is the electrode spacing for the surface electrodes, 0.1 m? what is the exact measurement configuration? The current description is too brief to get the idea of how the measurements were done (for example, any surface to borehole electrode pairs for current injection?) I've tried to read the Mary et al. 2018 paper, despite the similarity between these two studies, the ERT/MALM acquisition was not fully explained in that paper either. 9. Figure 3 needs to be improved with better visualization showing the 3D feature. The facets are not distinct in this current plotting style and the authors may organize the subplots into two rows for easier comparison.

Detailed comments: Line 35. Is the word 'expended' supposed to be 'expanded'? Line 36. SPAC is repeated. Line 37. I suggest more references here besides the work by Dirmeyer et al., Line 39. More references should be included. Line 55. Can the authors reiterate the main motivation of the work? Line 85-94. This part introduces the potential of SP and IP in monitoring water update and root systems. However, this part seems to be a bit out of place as the prior and following paragraphs discuss the actual methods have been used in this study. Suggest moving this part to either prior to ERT or after MALM. Line 209. 'less intense', what does this mean? Line 213 – 214. 'The input of low resistivity water (15 âḐ̌m, measured in laboratory) caused a homogeneous drop of 214 the resistivity values that make the two images around plant A and plant B very similar to each other'. How much is the resistivity decrease? Could you give a specific number? Maybe the authors can plot the delta resistivity (difference) for both plant A and B and show more time-step results. Figure 6. Please label 'stem/soil injection' directly on the plot to aid the reading.

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