

Geosci. Instrum. Method. Data Syst. Discuss., referee comment RC2
<https://doi.org/10.5194/gi-2022-2-RC2>, 2022
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Comment on gi-2022-2

Anonymous Referee #2

Referee comment on "Design and construction of an automated and programmable resistivity meter for shallow subsurface investigation" by Antenor Oliveira Cruz Júnior et al., Geosci. Instrum. Method. Data Syst. Discuss., <https://doi.org/10.5194/gi-2022-2-RC2>, 2022

General comments

The authors present a promising open-source hardware and software prototype for electric resistivity surveys. The development of low-cost alternatives to existing instruments and provision of technical details is a valuable contribution to the advancement of new geophysical investigations methods. The manuscript focuses mainly on the description of the elements but provides results from a first field test as a proof of concept.

Minor Revisions

Unfortunately, the manuscript lacks clarity in many parts and is hard to follow. Several sentences need to be rewritten. Furthermore, there are a few aspects that I suggest to be discussed in more depth, which I outline below. After these issues have been addressed, the manuscript should be ready to be published.

Generally speaking, I can only support what the first reviewer already encouraged: the code could be already made public on a repository and the link mentioned in the manuscript, as well as further specifications of the instrumental set-up, to allow the community to reproduce and test the device. The data obtained when conducting the field test should also be made available to ensure the quality of the scientific work.

Specific comments:

In section 1 (Introduction) (lines 24-29) the use of resistivity meters in geological exploration is described. Here, I suggest adding literature references on the recent advancements in testing time-lapse resistivity tomography to monitor shallow subsurface saturation changes.

Most importantly, towards the end of the introduction, the manuscript would benefit highly from a concise description of the concrete goals in terms of cost, power consumption and component availability that they aim to achieve and a discussion on how these instruments can complement existing instruments in terms of performance.

Section 3.1 "Computational unit" claims that the flexibility of the instrument would allow testing of new methods of data inversion (lines 93 – 95). I highly encourage to support this with references from literature and to discuss advantages and disadvantages of conventional instruments. This comment relates to my comment on the introduction and could possibly be addressed together.

I encourage distinguishing more clearly between methods, results and discussion. I read section 4 ("Test") as rather an extension of the methods. The sentences in line 142-144, however, start with an interpretation and are redundant with what follows in section 5.

I understand that the focus of this work lies on the hardware and software engineering. However, the interpretation of the field test appears a bit short. The subsurface characteristics of the study site at the National Observatory are mentioned in line 149. I suggest that further information from previous resistivity surveys at this site should be provided and discussed together with the results obtained with this prototype. Later, in line 167, environmental effects (rainy season) are discussed, which should also be related to Figure 9, which is not referred to here. I recommend lining out how a second test during a different soil saturation situation could be carried out. Apart from that, the sentence in line 167 is long and should be reformulated in a more comprehensible way.

Further technical corrections:

Section 2 (Numerical methods): Sentence (line 55) is very hard to understand. The sentence should be clarified and possibly split into two. The sentence (line 59 and onwards) should also be simplified and split, as it is hardly comprehensible.

Are all analyses and plotting functions that the human-computer interface provides, of which a few, are shown in Figure 3, mentioned in this manuscript? They could also be shown in a diagram.

The order of the figures should be improved to match the text. Figure 9 showing the arrangements should be shown along with figure 6.

Figure 6 would benefit from a more detailed caption description giving more information on how to read the scheme.

Figure 7 requires adjustments concerning the readability of the y-axis as well as a spelling check.

Figure 9: Some units are not displayed correctly in the caption. Should it really be "4k7â□!"?