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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "A monitoring system for spatiotemporal electrical self-potential measurements in cryospheric environments" *by* Maximilian Weigand et al.

Anonymous Referee #2

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As a user of SP field data, this manuscript is of great interest. There is a growing body of work on the mechanisms of SP generation, but still an overall lack of understanding of how to collect and process SP data appropriately, particularly when it comes to the collection of long-duration data sets.

I agree with the authors, and the review of Damien Jougnot, that there is a need to develop equipment for long-term measurements. I would add that along with collecting the data, there is a need to understand the various sources of noise in SP data and how they can be treated. While the authors have taken great care to point out that they are not making process-based interpretations of the SP data in this instrumentation paper,

the scale of the various noises identified brings into question whether "extraction of robust data" is possible. Most of the noise sources are on the same scale of magnitude as the signals themselves, if not larger. In the discussions, multiple possible noise sources are presented, without thorough evaluation of how to discriminate one from another.

Specific comments: P9 L11: It would be useful to have information about the specific logger is used, before detailing the sampling schedule.

P9 L11-16: I agree with SC1, this text is unclear. Could you provide I diagram that shows which pairs are measured?

P11 L1: Seems worth noting that this was installed due to actual lightning damages, mentioned in passing on P20.

P13 F7: The vertical black line is missing.

P13 F7 and P20 F13: These two figures make it very clear that it is necessary to 'get back to basics' regarding SP measurements. This magnitude signal noise, measured between electrodes spaced at a cm scale, brings into question the ability to make interpretations on SP measurements of the same magnitude, collected between electrodes meters apart. This is motivation for the community to work on this persistent problem, but would be a great place to add some discussion of how this might be tackled.

P13 F8: Consider plotting the red line on the same scale as the original data, and then providing a second plot of it at a larger scale. It's challenging to interpret when the 0 of the two graphs is in different places on the two axes. Caption says 2-hour average, legend say 1-hour. Is it possible this noise is from the solar panels?

P16 F10: Make the two curves that you are comparing E05-E01, and E05-01 superposition the strongest curves (non-black?), and the E16-E01 curve fainter. I was visually comparing blue and purple for a long time, until I realized there was a black line, too. As other reviewers have mentioned, a moving average of 12.5 hours seems very long,

if you are aiming to measure subsurface water flow, which might occur on shorter time scales.

P19 F12: There are at least six different greens. Yellow? Regardless, consider correlating the color of the measured pair, and the non-reference electrode. Alternatively, since there is no way to differentiate in the 15-16 individual curves, consider plotting all data as faint/thin black lines and only highlighting in color the few that you discuss in more detail.

P20 L12: What is meant by resolved in this case? Solved or completely shown?

P24 L1: Remove "huge" potential. A great tool to collect these data has been presented, but many questions persist about the use of the data.

In conclusion, the authors present a very detailed information about how they addressed the numerous challenges of working in such a remote environment. With some work on the organization of ideas, the manuscript could be of interest to many who are considering adding SP to ongoing research in any environment.

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