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

Anonymous Referee #1

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Being involved in several long-term magnetotelluric monitoring, I am really interested in the topic faced in the manuscript. As a general comment, I think that the authors made an excellent job in designing and realizing an effective monitoring system. Without entering too much in the discussion of the quality of the collected data whose analysis goes beyond the aim of the presented paper, I have just few comments/questions (see below).

In figure 2, the electrode layout at the Schilthorn summit is presented. From the colour scale adopted, it is only clear that the S-E corner (upper left corner of the figure) of the layout is where the maximum elevation of the area is reached but it is not clear the

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topography of the area. The Authors could try to make clearer the figure by adding isolines or by changing the used colour scale.

Page 6, lines 1-3: the sentence “Past studies have also greatly benefited from magnetic measurements for assessment of magneto-telluric signal components, water pressure sensors (e.g., Blake and Clarke, 1999), and pH probes.” is quite confusing. The simultaneous record of magnetic signals allows the application of the magnetotelluric method which provides information of the electrical subsoil structure at a much higher depth of the ERT. Are the benefits to which the Authors refer related to a deeper investigation depth of the magnetotelluric?

Page 14, lines 8-9: “The observed signal levels exhibited are large in comparison 10 to expected low-frequency SP signals, yet low-pass filtering reveals a clear diurnal signal (Fig. 2, red line).” I think there is a mistake, the correct figure is FIG. 8

Figure 9: The figure shows the temporal evolution of contact resistances over the whole measurement period of 2017 and 2018. Commenting this figure, the Authors state at pag 14 that “However, the actual values of the resistances differ with the electrode pairs, with very high resistances (red colours) occurring for some electrode pairs, and 30 relatively low resistances (blue) showing up intermittently for the electrode pairs 3-4 and 6-7.” By looking at figure 9, it seems that the pairs 3-4 and 6-7 undergo to an abrupt an simultaneous change in contact resistance at the end of November (?) but a similar change is not observed in other pairs involving electrodes 3,4,6,7. This last observation seems to exclude an electrode malfunction. How do the authors interpret this phenomenon? Is in their opinion linked to a variation of the measuring condition?

Figure 12: By looking at the temperature reading related to each electrode position, it seems strange that 2 electrodes (I am assuming the 15 and the 16) have a temperature which is more than 2°C lower than the temperature recorded in other electrode positions. Considering the relatively small distances between the electrodes, is this difference realistic? Furthermore, figure 13a reports again the temperature reading of the

electrode 16 and the temporal trend observable here is different by the one reported in figure 12. Am I interpreting in a wrong way one of the figure or is there something wrong?

Page 22, lines 4-6: “However, we would like to note that all recovered periods can be associated with global tidal processes (e.g., Egbert and Booker, 1992; MacAllister et al., 2016).” A simpler explanation involves the presence of a diurnal variation of geomagnetic field which results from perturbations of the Earth’s ionosphere and depends to disturbances of the upper-atmosphere, mainly due to solar activities. As also reported in some magnetotelluric textbook (e.g. Chave AD, and Jones AG (2012). The magnetotelluric method: Theory and practice. Cambridge: Cambridge University Press.) this diurnal variation is expected to affect also the telluric recordings.

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