

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2021-51

Anonymous Referee #2

Referee comment on "A portable lightweight in situ analysis (LISA) box for ice and snow analysis" by Helle Astrid Kjær et al., The Cryosphere Discuss.,
<https://doi.org/10.5194/tc-2021-51-RC2>, 2021

The paper "A portable Lightweight In Situ Analysis (LISA) box for ice and snow analysis" by Helle Astrid Kjær and coauthors reports the description, application and preliminary results of a new simplified portable CFA apparatus. The system, as shown in the paper, is able to continuously melt firn cores and to measure a bunch of parameters in the meltwater stream, namely conductivity and hydrogen peroxide. The system can be improved with additional analysis lines (nitrate, dust, ammonium, calcium etc) and it fits in an insulated box. Since this system is easily transportable it could be of interest for the ice core community but it can surely be improved in the future. I think that the paper is suitable for publication in TC, after that the following issues will be properly addressed.

Major comments

The main flaw of the paper is that the discussion about accumulation rate is a bit misleading and should be clearly assessed that it is just a speculative discussion. In fact, the recent accumulation rates at several sites were compared with very long accumulation rate histories and the authors drew some conclusions from this comparison. The text dealing with the accumulation rate discussion with respect to previous records needs to be made clearer, pointing out when there is an overlap among the records and when there is a lack of overlap.

A point of weakness of this new instrumentation is the method used for the depth assignment of the analyzed ice sections. The authors propose different solutions to solve this problem but they need to find a robust and portable solution to be added to LISA. In the text is not mentioned if a weight on the core section is used to help the melting speed being constant. If not used, I would suggest to try this solution in order to have a relatively constant melt rate, more independent from the amount of ice left during the melting procedure, as already described in several papers (i.e. Severi et al., 2015, Anal. Chem).

Minor comments and typos

Abstract: I would recommend to remove the reference to figure 1 in the abstract. The abstract should be self-consistent.

Page 1 line 24 and 26 and several other times along the manuscript: missing spaces before brackets.

Figure 3: the flow rates reported in figure 3 are not consistent with the text. Is the flow rate of the melted sample 3.0 or 5.0 mL/min? And the same for the reagents. Please, correct the figure or the text.

Page 7 line 18: Was the H₂O₂ reagent kept frozen or just refrigerated?

Page 7 line 27: remove "both"

Page 8 line 15: change to °C

Table 1: use superscript for kg/m³. The w.e accumulation should be expressed as cm yr⁻¹

Page 12 line 6: "by assuming that"

Page 12 line 18-19: this sentence is not clear. I can guess its meaning but it should be rephrased.

Page 13 line 21: do you mean "simultaneously"?

Page 13 line 22: change to "highlight that"