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The Cryosphere Discussions
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Interactive comment on "Passive seismic recording of cryoseisms in Adventdalen, Svalbard" *by* Rowan Romeyn et al.

Anonymous Referee #1

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I read this manuscript with pleasure: it is very well written and very detailed and therefore very clear. As a seismologist, I was interested to see that other surface-waves analysis and modelling tools were used in other communities. While the names and terminology were different, I could recognize familiar approaches.

I think the analysis presented in the paper is robust, and the data and results support the interpretations and conclusion. I only have minor comments to make to add to the discussion.

1) I feel that the events location method used in the paper is very similar to the Match Field Processing (MFP) described by Sergent et al. (2020) (adapted from previous sources). The advantage of the MFP is that its methodology is clearly defined both theoretically and practically. It is also quite adaptive with several tunings that can make

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Discussion paper

it very high resolution. I wonder why the authors did not try this approach with their arrays which are very well designed for that. Could you comment on that and perhaps compare the different methods?

2) In the aim of continuous long-term deployment to perform temporal monitoring of the permafrost, the fit "by hand" of the dispersion curves with their forward modelling in a 1D model seems inadequate. The best strategy, in this case, is to invert the dispersion curves to obtain the best fitting layered velocity model. There are many examples in the literature using this approach. However, it is quite rare to observe that many higher modes in data and existing inversion strategies might not be able to take all the modes into account. From your forward modelling strategy, would it be easy to design an inverse procedure? If yes, how would you do it? If no, what approach would you take? I think discussing this point would be a nice adjunction to the manuscript.

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