

Dear Dr. Hodson,

Thank you for your initial responses to the open discussion.

The reviewers were generally favourable, but they want a number of items clarified. RC1's comments appear to be readily dealt with by improving the justification of the methods as you suggest. In contrast, RC2 provided a number of general and specific comments, but only the general comments were responded to though many of the specific comments are highly relevant. The reviewers provided many helpful suggestions that will help improve the paper, such as making justifications clearer and improving the background section. Ultimately, none of the critiques appear to be "off-base", and simply stem from some aspect that was not clear to the reader or some assumption or justification that appeared to the reader to be missing.

RC1 and RC2 do raise some questions about your exploration of emission fluxes. RC2 suggests that a more qualitative approach is warranted, and you seem amenable to this proposal, so please do. The data reported in the paper are on groundwater chemistry inferred from pingo springs and groundwater springs. There are no data on emissions, and both reviewers commented specifically on the estimation of methane emissions. Clearly the open-system pingos are a source of methane, but with the present level of uncertainty regarding actual emissions, I do support a change in the title that focuses on the data at hand and the study design. Perhaps something like "Springs from open-system pingos a source of highly concentrated sub-permafrost methane, Svalbard, Norway", or "Highly concentrated sub-permafrost methane sourced from open-system-pingo springs in Svalbard, Norway", or "Sub-permafrost groundwater from open-system-pingo springs a source of highly concentrated methane, Svalbard, Norway".

As a final comment, it is best to treat this manuscript as a stand-alone item, and not weigh heavily on Hornum et al. (2020) that is still in review. If there are background points that you can make in the present manuscript, please do.

In your Author's response to this decision I would like to read point-by-point responses to all of the reviewer's comments and questions and please indicate where any changes occur within the revised manuscript. Though the responses to the comments and questions may not alter the findings substantively, there enough potential changes to the manuscript that further review is warranted. Therefore, based on the reviewer's comments and your related discussions I will recommend publication subject to revisions (further review by editor and referees).

Thank you once again for contributing to *The Cryosphere Discussion*, and I sincerely look forward to reading a revised version of this manuscript.

Best regards,

Peter Morse