

Biogeosciences Discuss., referee comment RC2
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Review of "Evaluating alternative ebullition models for predicting peatland methane emission and its pathways via data-model fusion" by Ma et al.

Anonymous Referee #2

Referee comment on "Evaluating alternative ebullition models for predicting peatland methane emission and its pathways via data-model fusion" by Shuang Ma et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-316-RC2>, 2022

In their manuscript "Evaluating alternative ebullition models for predicting peatland methane emission and its pathways via data-model fusion", Shuang Ma and co-authors present their evaluation of two different formulations of the ebullition process in methane components for Land Surface Models, the Ebullition Bubble Growth approach and the Ebullition Concentration Threshold approach. They evaluate these approaches against methane flux and concentration measurements from the SPRCUE site using an MCMC approach and find that the Ebullition Bubble Growth model is far superior.

The authors make a very convincing argument why the Ebullition Bubble Growth approach is superior, which solves one of the many issues that need to be addressed in making methane emission models more reliable.

I am very much impressed by the manuscript. It is superbly written and about ready for publication as it is, though I have found a (very) few minor details. I really must congratulate the authors, as I've never before seen a manuscript that was as good as this during the first round of reviews.

As mentioned above, the manuscript is nearly ready for publication, but there are a few minor things to be sorted out:

- Lines 160-162: Double "in this study" -- please remove one.
- Lines 181-183: Sentence starting with "Samples shallower than..." sounds slightly

awkward, I suggest rephrasing it

- Line 357: I don't see any blue shaded areas in the plot, I only see blue lines.

Reformulate.

- Line 452: The model is called ELM_SPRUCE, I assume, not ELS-SRUCCE, as is written?

- Line 455: "...concentrations ... was still not...". Noun is plural, verb is singular. Better use "were" instead of "was".