

## ***Interactive comment on “Uncertainties in modeling CH<sub>4</sub> emissions from northern wetlands in glacial climates: effect of hydrological model and CH<sub>4</sub> model structure” by C. Berrittella and J. van Huissteden***

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Berrittella and Huissteden present in their manuscript the sensitivities and limits of current large scale modeling of methane (CH<sub>4</sub>) emissions from natural wetlands. They test the sensitivity for two model setups and different climatic periods during the last glacial and present day in Europe. This is of special interest for warm interstadials during marine isotope stage 3, when wetland CH<sub>4</sub> emissions in the northern hemisphere are substantially increased according to polar ice core studies. An important outcome of this work is that the CH<sub>4</sub> emission sensitivity for interstadials is only captured in

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their complex peatland model, but not in the simple parametrization model. Whereas the sensitivity to exact water table position is not that large, as long as its mean and variability is well represented.

The work is certainly a welcome contribution towards efforts of large scale modeling of CH<sub>4</sub> fluxes from northern wetlands and understanding the variations of the past atmospheric CH<sub>4</sub> variations. The paper is well structured and easy to follow. Unfortunately, the text is rather badly written and sometimes not very precise. The figures deserve a quality improvement to be in line with the quality of the science. I therefore strongly suggest a major revision of these two aspects of the manuscript, including as well the following specific comments.

Abstract:

correct "... during the <last> 800 000 years ..."

Introduction:

p. 820, l. 6, add a reservation that processes on a global scale are not completely identical since the large NH ice sheets are missing at present day.

Modeled climate changes:

p. 826, l. 9, interstadial? not stadial? please reformulate this sentence, it is not clear what is meant by modern climate emissions and present-day (model?) emissions.

p. 828, l. 19-28, What is actually the model resolution? How exactly was the 30" resolution topography map averaged to the model resolution using the sigmoid shaped membership function? This information is important for wetland maps in future model comparisons.

Results:

p. 829, l. 27, How long were the fluxes integrated over time? How well does the model reproduce the seasonality?

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p. 830, l. 25, double expression "formation" doesn't make sense

Discussion:

p. 832, l. 18-25, From this paragraph it's not clear if a larger value Q10 actually increases the area of methane emissions or if it increases the flux rates from all areas. Please clarify.

Table 1:

- add units
- reference in caption to Fig. 1 is wrong, but not in line with Fig. 9 either
- if possible add numbers for change in emission area (land/exp. seafloor)

Figures:

- general: add units in the figures or the captions!
- improve the the visibility and map projection of figs 1, 2, 10
- "reduce" 3D bars to 2D in figs 3 & 4
- move y-axis of Fig. 9 to the side

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