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Comment

Interactive comment on “Sensitivity analysis of a wetland methane emission model based on temperate and Arctic wetland sites” by J. van Huissteden et al.

Anonymous Referee #2

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General comments:

This manuscript reports on a parameter sensitivity analysis done on the CH₄ emission model of Walter et al. The authors applied a GLUE (Generalized Likelihood Uncertainty Analysis) methodology that has previously been used to evaluate hydrological models. They ran the methane model using different parameter sets for which the parameter values were randomly chosen within a pre-defined value range. They had measurement data from three wetland sites and those were compared with the modelling results using three different objective functions. As a result, the authors found that the model is reasonably capable of simulating CH₄ fluxes, but not very good at

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simulating short-term temporal variation. The model is most sensitive to vegetation parameters and temperature sensitivity of the methanogenic microbial population, but not to soil parameters. Parameters for vegetation and microbial population strongly interact since some of them act antagonistically.

The paper is interesting and apparently this kind of parameter analyses on wetland-methane models have not been published earlier. It is well written and easy to read. Background and motivation, Walter's model, the GLUE methodology and the results are clearly presented, and Conclusions summarizes the results well. I suggest this paper to be published with minor revision.

A couple of specific questions:

1) Section 4.1. Not being an expert on this kind of statistical methods, I would like to see clearly mentioned what is the difference between a Monte Carlo simulation and running the model with a multitude of different random parameter sets. Or is there a difference?

2) Equation (5). Please define σt .

3) Conclusions page 9108, row 26 (and other places, e.g. page 9102 row 25). You say the model could not follow short-term temporal variation of the fluxes. How much could ebullition affect this and which parameters are significant in determining ebullition events?

4) Conclusions page 9109, row 28. You mention that the parameter sensitivity and the parameter values resulting from the GLUE optimisation agree well with a priori knowledge on the parameters. You do not, however, present the 'real' parameter values anywhere. Are the ranges in Table 1 realistic, taken from observations from arctic and temperate wetland sites, or do they include unrealistic values? If there also were values lower than/exceeding the realistic range, did they result in behavioral runs?

Some technical comments:

Page 9088, row23: Likelihood

Page 9094 row 4: (Van der) Van der Molen

Page 9105, row 5: differences. . . arise

Page 9105, row 6: missing comma?

Page 9105, row 18: Eriophorum?

Page 9105, row 20: you have twice “on the floodplain”

Page 9109, row 26: . . .in particular since (the) these have. . .

References: Berritella/Berrittella?

References: Wagner and Pfeifer/Pfeiffer?

Fig. 1. Caption: chosen

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