

Interactive comment on “Uncertainties in modeling CH₄ emissions from northern wetlands in glacial climates: effect of hydrological model and CH₄ model structure” by C. Berrittella and J. van Huissteden

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General comment: The second reviewer characterizes the scientific contents of our manuscript as 'sound, if not particularly groundbreaking' - a qualification which we regard as a strong compliment.

With respect to the scientific contents the most substantial remarks concern the model validation. According to the referee this should have included spatially integrated CH₄ flux data. We agree that –in theory- these data should do a better job in integrating

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the spatial heterogeneity in the landscape than the point source data that we used for validation. However, for technical reasons eddy covariance data are still very scarce and recent papers (e.g. Hendriks et al., 2008, Wille et al., 2008) have shown that these data do not always compare well with the more traditional chamber flux measurements. Moreover, at the scale of our modelling study, these data should be considered as point data also. The other data sources that the reviewer mentions suffer from considerable addition of CH₄ from anthropogenous sources. Even in studies on present-day CH₄ fluxes, natural and human-induced fluxes cannot be separated from each other without modelling. Therefore these data are much less well suited for model validation of Pleistocene CH₄ fluxes than the reviewer suggests.

The reviewer has strong criticism about the presentation of the data. We certainly agree that our English is not perfect and a language check by native English speakers has been already arranged. However, these qualifications are very difficult to reconcile with the 'well structured and easy to read' judgment of the first reviewer and the 'well structured and easy to follow' statement of the third one.

The reference of Kaplan et al (2006) is useful and will be added to the Introduction section. Improvement of the figures is justified. A uniform projection will be selected for all maps. Part of the readability problem of the figures is caused by graphics format conversions, which will be redone. The figures will be enlarged where necessary.

References Hendriks, D.M.D., M.K. van der Molen, A.J. Dolman, J. van Huissteden 2008. A compact and stable eddy covariance set-up for methane measurements using off-axis integrated cavity output spectroscopy. *Atmos. Chem. Phys.*, 8, 431–443.

Wille, C., L. Kutzbach, T. Sachs, D. Wagner, E-M. Pfeiffer 2008. Methane emission from Siberian arctic polygonal tundra: eddy covariance measurements and modeling. *Global Change Biology* 14, 1395–1408, doi: 10.1111/j.1365-2486.2008.01586.x

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