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Interactive comment on "WETCHIMP-WSL: intercomparison of wetland methane emissions models over West Siberia" *by* T. J. Bohn et al.

Anonymous Referee #1

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General

This paper on Intercomparison of wetland methane emissions models, using the West Siberian Lowlands as a test area. It is a very useful evaluation of the performance of models and wetland data sets used for modeling, and it clarifies the sources of the strong variability of wetland methane emission estimates produced by models. It shows the large effects of input data, in particular wetland or soil moisture/inundation mapping products, and of model structure. The choice of the West Siberian Lowland as a model test area is a very appropriate one because of the availability of test data sets and the large contribution of this area to northern wetland methane emissions. To simulate northern wetlands accurately, it is crucial to determine model features that are required, and to which parameters and input data these models are most sensitive.

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Interactive Discussion
Discussion Paper

The conclusions which are drawn in this paper, can be considered as guidelines for improvement of methane emission models for northern wetlands.

A minor drawback of the paper is, that there is hardly discussion on what actually defines a wetland, although the word 'wetland' is used throughout the paper. This is not just a matter of theory. Each of the wetland data sets used as model input, and each of the models, implicitly contain a certain definition of wetland. To understand the differences between the model outputs properly, it is important to know what these implicit definitions of wetlands look like. For instance, do the "Sheng2004" and "Peregon2008" include smaller lakes, and if so, to which size limit, and what determines the delineation of wetlands from non-wetland areas? Likewise, from the description of the models it is clear, that some models define wetlands based on hydrological modeling (e.g. TOPMODEL), and some require input of external wetland data sets. Some of these data sets (e.g. GIEMS) appear to map only inundation, while methane emission is not necessarily restricted to inundated soils (as also concluded in the paper). Again, 'inundation' is an implicit definition of wetlands. Elsewhere (p 16) it is suggested that wetlands always imply the presence of peat soils, which is not always the case. I suggest the authors to pay some attention to definition of wetlands, and their relation to methane emission, soil type and the delineation of wetlands. It would be useful to list these implicit wetland definitions in the input data sets.

Specific remarks

Page 6, line 16-18: "The vast majority of these wetlands are peatlands, with peat depths ranging from a few cm to over 5 m, comprising a total soil carbon pool of 70 Pg C (Sheng et al., 2004)." Note that in most soil classification systems, soils with less than a few decimeters of peat would not classify as peat soil but as mineral soil.

Page 7, line 15-23: Please provide some more information on the remote sensing inundation products. Do they contain information on the seasonal variation of inundation, if so, what is the temporal resolution?

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Page 8, line 26-27: “In both cases, monthly coefficients (uniform in space over a region) were derived for each of 11 large regions of the globe.” It is difficult to understand immediately what is meant here. Try to reformulate.

Page 16, line 27-32: This is not very clear. Are wetland soils taken as synonymous to peat soils, and if a wetland data set indicates the absence of wetlands, the soil is automatically assumed to be a mineral soil? Please explain.

Page 21, 13-27. This demonstrates my point about wetland definition, explained above. Again, could there be overlap between the inundation data sets and lakes, of which the carbon cycling and methane emission processes may indeed differ from those in terrestrial wetlands?

Page 23 1-2: You could add here also, realistic soil freezing and thawing, for proper simulation of permafrost wetlands.

Page 23 5-12: This effectively means that realistic soil hydrology is necessary, calculating water table depth independent of wetland delineation.

Tables 2 and 3: These tables suffer from too short and non-informative captions. For instance the ’code’ should not be described in the text only, but also at least an indication of what it means should be given in the caption

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Interactive comment on Biogeosciences Discuss., 12, 1907, 2015.