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Biogeosciences Discussions

# *Interactive comment on* "High resolution wetland mapping in West Siberian taiga zone for methane emission inventory" *by* I. E. Terentieva et al.

**Anonymous Referee #2**

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General Comment: One of the main sources of error in regional and global estimates of CH4 emissions from peatlands is fine-scale heterogeneity in the main controlling factors such as water table depth, aerenchymous vegetation cover and peat temperature. Measuring emissions over vast areas is an extremely difficult task as you have pointed out. Very high spatial resolution remote sensing (RS) data could help quantify fine scale details but lacks wide area coverage. Moderate resolution RS data has a wide coverage, but is unsuitable to discern the heterogeneous surface of peatland. In your case you used moderate resolution data such as LANDSAT 7 with pixel size of 30 m which in my opinion is not suitable to quantify peatland microforms and its fine scale heterogeneity such as hummocks, hollows and mud bottom hollows and many small pools less than the size of your LANDSAT data resolution that has significant



contributions to the overall methane emissions from the peatlands/wetlands. Further, a spectral classification technique such as the one you have applied using maximum likelihood classifier on the imagery with 30 m pixel resolution would result in miss classifications, and is not suitable for classifying peatland microforms such as mentioned above. You have reported burnt areas in the landscape but you did not explain how you distinguished mud bottom hollows and burnt areas which I suspect would have similar spectral signatures thus resulting in further misclassifications. Suggestions: I suggest you get IKONOS data (both PAN and Multispectral data) and redo the classification using object based fuzzy logic techniques wherein you can define rules for all possible classes and expect an improved result. There are many good papers in the literature on the object based peatland classifications. Your current work does not make a significant improvement in accurately quantifying GHG budget. Specific Comments: P:20151, L-9: You mentioned, " Present land cover products failed to capture the fine-scale spatial variability with the wetland", which is also the case with your research wherein you have failed to capture the fine scale heterogeneity as I mentioned above. When you say fine scale could you describe the resolution you are talking about? P20152, L-20: Could you cite latest weather data, were you not able to get this information after the 1963 reference? What convention did you use for the classification of the peatland micro and macro structural elements? This is a pity that until date there is not a single acceptable convention on peatland classes that are globally acceptable within the community. P:20154, L-7: " image classification on a scene by scene basis, regrouping of the derived wetland complex" : What were the wetland classes initially obtained from the maximum likelihood classifier that you have regrouped into the 9 classes as described in table 1? How you extracted this information from the scenes? Could you elaborate? The regrouping of the 9 classes in Table 1 are very generic and would not help in accurate estimation of methane quantification if your main objective is to quantify the GHG. You have only one data type, i.e., Landsat 7 data and no DEM or any other auxiliary information. How did you incorporated water table information at the landscape scale to characterize wooded wetlands and patterned wetlands? P:20154,

L-14: what thresholding methods , please describe P:20155, L-4: What is the resolution of your ground truth data from the Google Earth? P:20155, L-9: Ridges, hollows and hummocks (hummocks are totally missing in your entire paper) are individual microstructural elements within the peatland landscape. But as per your convention you have in table 1, how did you define the boundary conditions for RHCs and RHLCs within the pixel of your satellite data? P:20155, L-10: Methane emission varies within a small spatial distance of few meters within the peatland as a result of differences in surface structure and functional traits of the vegetation and microforms differ greatly in ecosystem processes. For example, methane (CH4) emissions can vary by two- to four-fold across microforms that may be separated by only a few metres (Moore et al.,1990; Huttunen et al.,2003; Kettunen 2002). This means that a pixel resolution of 30 m will not capture such fine scale variations, hence any attempt to estimate methane budget from a coarse resolution data such as yours would introduce bias from the start. P:20155, L-27: What are the other ecological functions you are referring to for upscaling? P:20160: why these sections are part of the Results section? P:20162, L-1: " However the small areas do not make substantial. . .." if you coalesce all the small pools then the contribution of methane emissions could become significant at the landscape scale.

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Interactive comment on Biogeosciences Discuss., 12, 20149, 2015.