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Biogeosciences Discussions

Interactive comment on "Do we miss the hot spots? – The use of very high resolution aerial photographs to quantify carbon fluxes in peatlands" *by* T. Becker et al.

T. Becker et al.

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The authors are thankful for the review by the anonymous referee ♯3. A revised manuscript is being prepared based on her/ his comments. Below are our comments to the different issues raised by the reviewer.

The abstract presents a good summary of the study, except for the last sentence which is long and hard to follow. I suggest punctuating sentence or splitting it up in two.

We followed the suggestion of the referee and splitted the sentence into two. It now reads: It is important to note that the observed resolution effect on the carbon balance estimates can be much stronger for other ecosystems than for the investigated peatland. In the investigated peatland the relative hot spot area

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of the flarks is very small and their hot spot characteristics with respect to CH_4 and CO_2 fluxes is rather modest.

On P1099 L12-13 it is said that upscaling based on land-cover maps gives the most reliable extrapolation, please elaborate on why this is.

While vegetation mapping in smaller areas and along transects cover just a fraction of the study area they do not necessarily represent the situation in the whole study area. Another problem is the spatial distribution of the sample plots for the vegetation mapping which have to be randomly distributed. Using a land-cover map of the complete area under study you can avoid this problem, because all the existing variations of vegetation patterns at your side are covered. This is the reason why we think the last approach promises the most reliable spatial estimates and thus the most reliable flux extrapolation. See also our elaborations in the text.

Gas flux measurement method is well described, but the modeling procedure to construct time series of CO_2 and CH_4 exchange is unclear. Six predictors where used in a multiple regression analysis to model CO_2 exchange; what about multicollinearity between e.g. air and soil temperature? Were respiration and photosynthesis modeled separately? How good were the models (coefficient of determination, statistical significance etc)? Why was wind speed used as a predictor when closed chambers were used? The same applies for CH_4 model. Please describe more thoroughly.

The questions of both referees to the modelling of the gas fluxes and the used variables are pointing on the preliminary work status of our model and the problem of multicolinearity of the variables. We agree with the referees that the problem of multicolinearity is given. Hence we adapted existing models on our situation. In section 3.1 (Gas flux measurements and carbon budget calculation) at paragraph four now the computation and the appropriate references are elaborated.

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Adjust unit

We adjusted the unit in the last sentence of section 3.2

I am interested in more details regarding the dirigible. Perhaps a photo of it could be included?

A picture of the blimp was included as figure 2.

I also think that other research groups that may want to try your method are interested in total cost of the equipment.

The total cost of the equipment is now included in the paper. All the equipment necessary for aerial photography with a blimp is calculated in the mentioned 1600 Euro. However, the cost for helium differ from provider to provider and the camera equipment that we bought might be not availabel anymore.

How was the accuracy of the derived land-cover map estimated?

The accuracy assessment was conducted using a subset of a vegetation survey done in July 2005 at the six GCPs and within the 12 frames for gas measurements. These 18 points are covered by the aerial photograph. See now at section 3.3, paragraph eight.

Why was the land cover map vectorized? Since it was created in raster structur, I assume the further preprocessing would decrease its quality?

The vectorization of the classification output (land-cover map) was necessary to analyze the single objects that build a land-cover class (e.g. hummocks), since the received classification output does not separate the classes to single objects. Using the Raster-To-Polygon function with the option No_Simplify in ArcGIS of ESRI the algorithm is set to assure that the polylines of the output polygone conforme to the input raster8217;s cell edge.

Please describe MSWA in more detail.

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According to the wish of both referees we extended the explanation for the moving split window analysis and added paragraph eight in the remote sensing section of the methods.

Flark area fluctuates between 200-300 m^2, and L19: lawn/hummock between 7000-7700.

We addressed this concern of the referee by adding tho following sentence: Below the mentioned thresholds the values varied around 7250 m^2 ($\pm$ 10 %) for hummocks/lawns and around 240 m^2 ($\pm$ 20 %) for flarks, respectively.

Training area for algorithm is mentioned. Please describe this in methods section.

The method of defining training areas differs from software to software. Hence we describe the reason why training areas have to be defined. The cited book of Lillesand and Kiefer is explaining the method thoroughly.

There are some interpretations of the graphs in this section; e.g. sentences starting with P1103 L21 “The oscillation”, P1103 L22 “Furthermore”, P1104 L2 “This effect”. I suggest moving this to discussion section.

Following the suggestion of the referee we moved the sentences into discussion section.

Judging from the land-cover map (figure 2), lawns do not seem to constitute isolated polygons, but rather a big area with flarks and also hummocks to some extent as islands in it. How was mean object size in table 3 for lawns calculated? Secondly, based on the mean object sizes, ratio of mean object size to ground resolution was calculated (table 4). Which variables and units were used (e.g. resolution in cm^2 and object size in cm^2)? Please include units in table 4 caption.

Based on the referee comment and the discussion with all co-authors we have withdrawn table 3 and table 4, and the subject of providing recommendations for ratios between size of micro-sites and the resolution of the underlaying land-

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cover map.

What is “effective greenhouse gases”? If it refers to GWP please include this and also which time horizon was used.

Due to the referee comment we realized the mistake. Since we are talking about carbon fluxes the sentence: “The total amount of effective greenhouse gases would be underestimated by $\sim$9.3 % between a ground resolution of 6 cm and 100 cm.” was withdrawn. The fact is now described as follows: Using a ground resolution of 100 cm the net ecosystem carbon uptake is overestimated by $\sim$2.13 g/m^2 ($\sim$5.5 %) in the sample area, compared to the highest resolution of 6 cm.

Table 1 is not referred to in text, and contains the same information as figure 3. I suggest to remove it.

We followed the suggestion of the referee and removed table 1.

CO2-C flux for flarks should have a minus sign?

Since the modelling algorithm changed the CO_2 fluxes in table 2 have a minus sign as well.

Which coordinate system does the numbers on x- and y-axis refer to, and what are units?

The matching coordinate system to the numbers in figure 3 is UTM zone 36N, WGS 84. The unit is meter. This concern is addressed in the caption of figure 3.

Interactive comment on Biogeosciences Discuss., 5, 1097, 2008.