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Interactive comment on "Upscaling methane emission hotspots in boreal peatlands" *by* F. Cresto Aleina et al.

Anonymous Referee #2

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The paper by Cresto Aleina et al. describes a novel method to take into account the microtopography of peatlands when simulating peatland methane emissions. They present the method and evaluate its performance by comparing the simulated emissions with two other options, a more detailed microtopographic Hummock-Hollow (HH) model and a simple bucket model that does not account for microtopography. The result was that the emissions calculated using the new parameterization were similar to the emissions simulated with the detailed HH model. It has been shown in an earlier paper that the HH model performed better than the bucket model in simulating the observed CH4 emissions. The work is interesting and worth publishing. Below are my comments that are mainly asking for some clarifications.

1) I suggest writing out more explicitly how the three different models depended on

forcing data in the different simulations.

- The Hotspot model was parameterized using years 1976-2005. So did you use for all the years 2006-2099 this same temporal pattern of q, i.e. was the area density of saturated surface always as shown by the dotted line in Fig. 2? Or did it change with climate in the future projection runs?

- Did the water tables of the saturated areas change with meteorological forcing in the Hotspot simulations? Or was the water table in the saturated areas always randomly something between -10 and 15 cm as shown in Eq. 5? How about the non-saturated areas, did the water table vary there?

- Did the Microtopography (HH) version simulate the water tables continuously, depending on the input data?

- You could discuss this: is it probable that the saturated surface area would change in the future and does it affect the results?

2) P. 8523 and 8526: Can you clarify the relationship between water table level W and surface S. Is W negative below the surface? Are the equations on page 8526 (the ones defining the surface types) correct? What is S there?

3) P. 8523, Eq. 1 and its explanation: is snowmelt denoted with Sn or S?

4) Page 8526, l 17: should the W^{sat} be W^s like in Eq. 5?

5) P. 8524 l. 20: Add a reference to a paper that uses the Walter & Heimann model. Page 8528, l. 5: Add a basic reference to what is RCP.

6) Table 2: It was difficult to understand the parameterization of the Hotspot model (P. 8529) since the text in Table 2 is slightly confusing. E.g. "initial day of the year of maximum saturation" sounds like there was a "year of maximum saturation", which apparently is not the case. I suggest you re-formulate these somehow, for instance "Initial date of maximum saturation" if it seems appropriate.

7) Page 8531, line 5: should it be "…simulated by the models"? Same page, lines 8-10; can you re-formulate the sentence, it is unclear.

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