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Interactive comment on “A model of the methane cycle, permafrost, and hydrology of the Siberian continental margin” by D. Archer

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The author devoted his manuscript to modeling methane cycling, permafrost and hydrology of the Siberian continental margin. As I devoted a significant part of my career working with colleagues on modeling the latter two, I have some comment regarding the mathematic side of the model.

In this new manuscript, the author repeatedly refers to the SpongBOB model as if it is a well-known mathematic algorithm or publically available software with all the terms and equations well described and discussed elsewhere in the open publication. I made my effort to find out such a detailed and clear to me as a physicist-mathematician description in the paper D. Archer's refers ((Archer et al., 2012), but, unfortunately, I have not found either detailed physical or mathematical descriptions there too. So, it is

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impossible to charge plausibility and validity of the achieved by modeling conclusions if it is not clear how the author implemented his assumptions in modelling runs.

However, one important thing about this model I can say right at first glance. Number of parameters claimed by the author to be used in the modeling process is significant, besides, variability of each parameters could be extremely high. This means that he had to perform numerous coupled calculations, for that he had to establish rather fine size of the grid cell in his numerical domain (which is 800 km by 10 km). What I see used by the author is a grid cell size of 23 km by 0.25 km. Not only is that it is impossible to achieve claimed purposes using such a coarse cell size, but also is that sizes of the cell sides differ two orders of magnitude. This is unheard of!

I would not recommend this model to be considered any serious until physics and mathematics behind it are transparent for specialists and construction of the numerical domain meets scientific terms.

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