

Our replies to the comments of Referee #1 are given below *in Italics*.

The topic of the manuscript is relevant for *Biogeosciences*. I guess, upon acceptance, the paper will be a highly citable study. However, I recommend some revisions before final consideration of this paper for publication. All suggestions for revision are minor and this is the reason why section *General comments* is skipped in my review.

Specific comment:

First of all, some earlier studies are not credited properly. In particular, in Sect. 1.2.3 (*Methane emission models*), I suggest to cite the paper by Yurova et al. (Yurova, A., A. Wolf, J. Sagerfors, and M. Nilsson (2007), Variations in net ecosystem exchange of carbon dioxide in a boreal mire: Modeling mechanisms linked to water table position, *J. Geophys. Res.*, 112, G02025, doi:10.1029/2006JG000342). In addition, I would suggest to cite the paper by Krupchatnikov and Krylova (Krupchatnikov, V.N., and A.I. Krylova (2000), Numerical simulation of methane distribution using data of ground-based observations, *Atmospheric and Oceanic Optics*, 13 (6–7), 574–579).

Firstly, we thank Alexey V. Eliseev, the 1st reviewer of our paper, for very constructive comments. We will improve the text by addressing the work of Yurova et al. (2007) as well as Krupchatnikov and Krylova (2000) in the revised manuscript.

Technical corrections:

— It seems there is a misprint in lines 11 and 12 at page 8 (equations for RL and RS correspondingly). I guess, in both cases it should be $Q(T - T_{ref})/10K$ rather than QT / T_{ref} .

The Q_{10} equations were displayed incorrectly. We will change the equation as suggested:

$$Q_{10}^{(T_{soil}-T_{ref})/10K}$$

— Symbol w_t in line 8 at page 7 is not explained.

We will explain the symbol w_t (water table) in the text and the corresponding table.

— For reader's convenience, at page 8 it is desirable to indicate that values of parameters sla and T_{ref} are figured in Table 2.

As suggested we will mention that the parameters sla and T_{ref} are shown in table 2.

— I suggest to reorder entries in Table 2 to put them in alphabetic order.

The entries will be thematically grouped and reordered alphabetically within the groups in the revised paper.

— There is a misprint in Table 1. In (Eliseev et al., 2008), methane emission model was coupled to Earth system model.

We will correct the misprint. For readers convenience we will furthermore ask the illustrator to improve the table to show tick marks and crosses instead of empty boxes.

Model	Rationale	Forcing	Peat acc.	CH ₄ emiss.	Coupled to ESM	Coupled to DGVM	Global appr.	Single-site
Eliseev (2008)	Response of CH ₄ (wetland) to climate change	Wetland extent, CH ₄ emissions	✗	✓	✓	✗	✓	✗

— In caption to Fig. 4, it is better to use term 'range' instead of term 'amplitude' to avoid ambiguity.

As suggested, we will modify the figure caption as follows:

*Right panel: **range** of changes in water table between spring season (MAM) and autumn (SON).*