We like to thank the reviewer for the time spent and the valuable comments. They helped us to improve the manuscript. Please, see below our answers to the single comments.

Reviewer 1:

1) in Figure 2 WTL (water depth) is expressed in m a.s.l. It should be presented in relation to the ground level. In line 164 authors report that the EC system collects data from a height of 2.2 m a.g.l., which means that the ground level is somehow determined. The WTL should be related to this level to provide information if the WTL is above ground level or at a certain depth in the ground.

WTL is related now to the ground level. Figure 2 has been updated and shown below. Furthermore, we found out that the WTL data from 2014 had unknown offset, as the elevation of the sensor was not properly recorded in the metadata. We have now calibrated the WTL data against another dataset, to remove this offset..

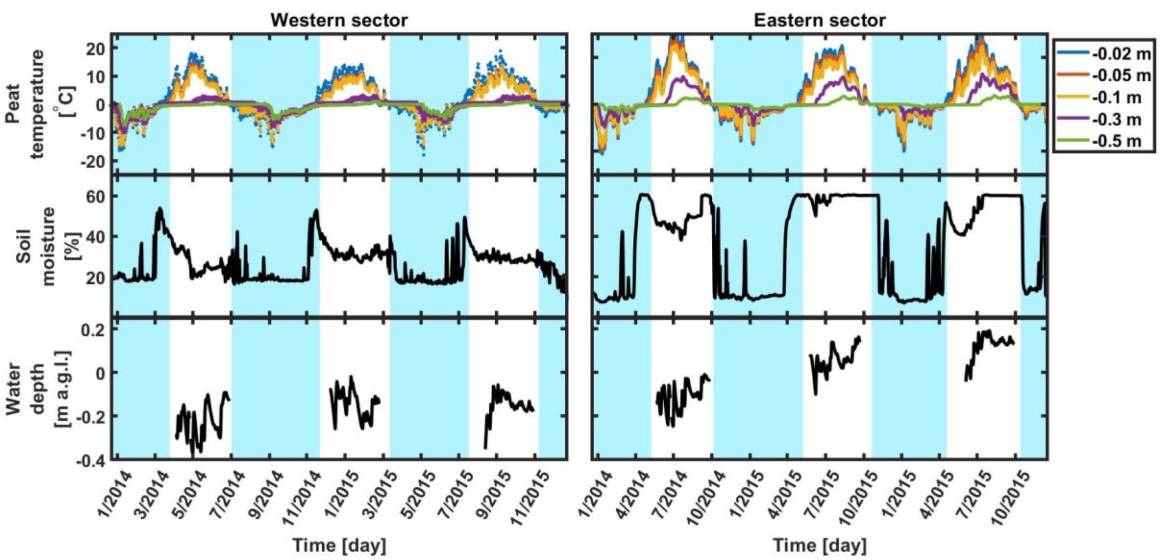


Figure1. Figure2 from the manuscript with the calibrated WTL

2) Figure 2 shows a jump in WTL between 2014 and the next two years by about 1 m for the western sector and several dozen cm (> 50 cm) for the eastern sector. It is surprising that the formation of such a thick peat aeration layer has not affected the CH4 flux.

After calibration the WTL, jump is not seen any more. Western sector is drier than the eastern sector.

3) In the case of such a WTL jump, its distribution should be bimodal (why in Figure S2 it is clearly visible for the eastern sector, and not visible for the western sector?) and the correlation between CH4 flux and WTL should be checked separately for each year.

WTL was not representative for the palsa part of the mire so correlation between CH4 flux and WTL has not been checked for this region. For the eastern sector this correlation was checked separately for each year and results are presented in table7. After calibration correlation between CH4 and WTL was checked one more time. Values are presented here and will update the table7.

Table1. Correlation and p-value for the calibrated WTL

Year and ecosystem	***R for CH_4 flux***	***the p-value for CH_4 flux***	***R for temperature normalized CH_4 flux***	***the p-value for temperature normalized CH_4 flux***
2014 E	-0.5	$2x10^{-4}$	$1x10^{-2}$	0.94
2015 E	-0.2	0.3	-0.2	0.17
2016 E	0.6	$4x10^{-6}$	-0.3	0.01

4) Even for the eastern sector, for which WTL is considered representative (ln. 380), the soil moisture in summer 2014 was lower than in the following two summers, while WTL was much higher in 2014 (Figure 2). How is it possible?

Calibrated WTL data and soil moisture are consistent now. Year 2014 was drier than other two years and it is visible in the WTL and soil moisture (figure above)

Ln. 397: Please mark the contribution level (e.g. 80%, 50%) on at least a few selected lines in Fig.3.

We will add% markers to the isolines.

Ln. 405: As seen in Figure S4, no diel cycle was observed – in my opinion Fig. S4 shows weak diel cycle, with 10-20% differences between nighttime and noon fluxes. Moreover, the potential diel cycle should be exanimated separately in the seasons. In summer, changes in solar radiation can cause a significant diel cycle of surface temperature

(temperature impulse), which may affect methanogenesis, while in winter there is no such forcing.

Figure S4 shows indeed slightly lower emission during mid-day hours. However, the difference is very small compared to the short term variation in the fluxes as indicated by the interquartile range. Thus, for the purpose of gapfilling this effect could be negligible in calculating daily averages. However, it is interesting to observe this type of diel cycle, with minima at daytime, and as reviewer suggested, it could have its origins on temperature cycle of the top peat layer. This could affect the methanotrophy, while the methanogenesis occurring at slightly deeper layers would be less affected. This would lead to higher methanotrophy at daytime and thus lower emission. We will include this discussion to the revised version of the manuscript.

Ln. 410-414: Information in Tab. 3 are a bit misleading. For example, for 2016 the coverage by a good data is 99% (sum for eastern and western sector), which seems quite unrealistic for EC method. In fact, the assumption that 10 good data over a full 24 hours is sufficient to calculate daily value (ln. 408) is a kind of gap-filling method and means that up to 58% (14/24) of data might be gap-filled by mean daily value.

The data point here refers to daily average value, which is indeed kind of gapfilling method. We will make this clearer in the caption of the table. As we require 10 half-hourly flux values (that have passed QC/QA) within a day, we can have days when we have acceptable daily average value for both wind sectors. The percentages for east and west are thus not additive. We can this have many days in 2016 that do not have average methane flux value for either sector or have it for both (59 points are common gaps or values). Additionally, model comparison does not show significant differences in CH4 annual emission based on the 30 minutes ("Jena" method) and daily averages (other methods). If the daily cycle and averaging with only 10 data points had significant impact, it would be visible in the figure 6 or figure 7.

Ln. 430-431: The peak season of the CH4 emission was defined as two weeks forward and backward from the day with the maximum daily emission in a given year– it is possible that a single high emission does not occur in the peak of the season, so why not use a 14-day moving average and next use the maximum of this function as the peak emission?

Differences in estimated day between maximum emission and moving average were not big. We changed growing season emission according to the new calculated period. Below we presented estimated DOY and Table1. Day with the highest emission calculated from the daily data and as the maximum of the moving mean

Table2. Middle of the peak season calculated in the two different methods

	Non avg	mov avg
	DOY	
2014 E	210	208
2015 E	240	245
2016 E	221	220

2014 W	204	210
2015 W	224	226
2016 W	218	225

Table3. Emission from the new calculated peak season

	Mean	***Standard deviation***	***The standard error of the mean***
	[mg-CH4 m-2 d-1]		
2014 E	54.3	23.0	5.8
2015 E	45.9	15.6	4.9
2016 E	60.7	9.0	2.3
2014 W	24.9	4.3	1.1
2015 W	21.5	4.3	1.3
2016 W	27.9	3.5	0.9

Table4. Emission from the peak season – old values

	Mean	***Standard deviation***	***The standard error of the mean***
	[mg-CH_4 m^{-2} d^{-1}]		
2014 E	54.2	22.3	6.5
2015 E	55.3	13.2	2.8
2016 E	59.9	9.4	2.7
2014 W	22.6	4.5	1.2
2015 W	21.4	4.2	1.1
2016 W	28.2	3.7	1

Ln. 436: Wintertime average emissions were 24 mg-CHm-2 d-1 for the eastern sector and 16 mg-CH4 m-2 d-1 for the western sector – but when we compare these values with Fig. 4, the 24 mg-CH4 m-2 d-1 level is clearly above the most of green tringles for wintertime (blue areas). Similarly, the 16 mg-CH4 m-2 d-1 level is above black dots at winter. It means that the quoted average values for the eastern and western sectors are amplified by gap-filled values, i.e., the gap-filled values on average are significantly higher than the measured once. Is that correct? Any reflection on this effect?

It was calculation error where averages from two winter periods were sum instead of averaging. We will update the values with correct ones in the revised manuscript.

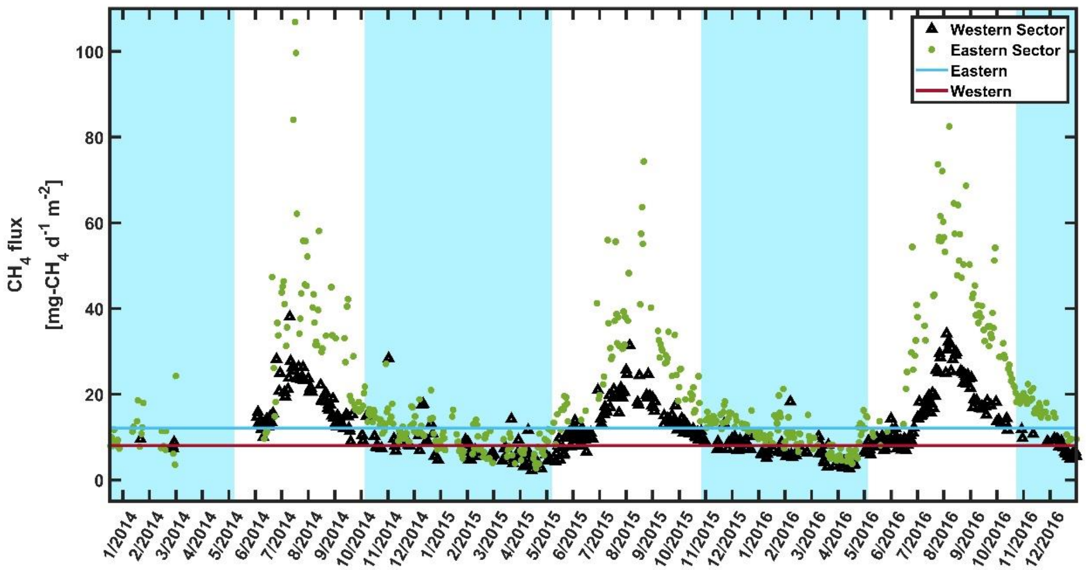
Table6. Winter emission – new values

	Mean	Standard deviation	The standard error of the mean
	[mg-CH_4 m^{-2} d^{-1}]		
2014 E	12.0	3.83	0.49
2015 E	11.1	2.27	0.26
2016 E	13.1	3.48	0.35
2014 W	9.6	3	0.64
2015 W	7.4	1.85	0.26
2016 W	7.0	4.51	0.58

Table5. Winter emission – previously calculated

	Mean	***Standard deviation***	***The standard error of the mean***
	[mg-CH_4 m^{-2} d^{-1}]		
2014 E	24.1	5.5	0.7
2015 E	22.3	3.5	0.4
2016 E	26.3	5	0.5
2014 W	19.2	5.2	1.1
2015 W	14.9	2.8	0.4
2016 W	14.0	3.1	0.4

Figure2. Averaged winter emission marked on the figure4.



Ln. 450 and Table 7: Controlling factors were examined before and after temperature normalization (Table 7) – please be more specific about which normalization is concerned. The normalization described in lines 402-405 refers to diel cycle. Of course, it doesn't make sense to correlate such normalized values with other (non-normalized) variables. At this point, the authors are likely to use a different normalization (exponential function of temperature), the same as Rinne et al. (2018). However, this only becomes clear on line 559.

This is correct. We will replace the sentence

"Controlling factors were examined before and after temperature normalization (Table 7), to avoid effect of cross-correlation between explanatory parameters."

with

"Controlling factors were examined before and after temperature normalization of the CH4 fluxes following Rinne et al. (2018) (Table 7). It was done to avoid effect of cross-correlation between explanatory parameters."

Ln.521-523: …the fen has the highest percentage of carbon emitted as CH4. The eastern and the western sectors emitted less of the carbon as CH4. – these sentences suggests that both ecosystems emit carbon also as CO2, while in the annual scale, they absorb CO2 (and total carbon)

Here we compare CH4 emission to carbon uptake as CO2. We will reformulate our sentence for clarity. We will replace

"As a comparison, data from a tall sedge fen area, where permafrost was completely thawed, of Stordalen Mire by Jammet et al. (2017) are presented, showing that the fen has the highest percentage of carbon emitted as CH_4. The eastern and the western sectors emitted less of the carbon as CH_4."

with

"As comparison, data from lake and tall sedge fen areas at the Stodalen mire complex, where permafrost was completely thawed, are also presented (Jammet et al., 2017). The fen has the highest percentage of carbon emitted as CH_4, as compared to the annual CO_2 uptake. The eastern and the western sectors emitted less of the assimilated carbon as CH_4 compared to the completely thawed area. The uptake of carbon as CO2 was also largest at the fen."

Ln. 576: … small variation, without strong extreme conditions, in the WTL – can WTL changes in >0.5m (differences between 2014 and next two years) be considered small?

After calibration the WTL was lower in the year 2014, but the difference between two other years is now much smaller. Variation inside one year in the WTL is not extreme.

Ln. 699-700:The seasonal cycles were furthermore characterized by a gentle increase in spring and a more rapid decrease in fall – in my opinion, Figure 4 does not confirm this, or even suggest something quite the opposite.

Thank you for this suggestion. We checked it and you are right. Rate of the increase and decrease were estimated and presented in the table below. Line 699-700 will be rewritten.

Year and ecosystem	spring	autumn
	[mg-CH4 m-2 d-2]	
2014 E	1.63	-0.59
2015 E	0.42	-0.35
2016 E	0.69	-0.55
2014 W	0.4	-0.22
2015 W	0.21	-0.16
2016 W	0.24	-0.25

Ln.: 706-707: the temperature at different depths seemed to control the CH4 fluxes for the two analyzed mire sectors – can the temperature profile measured at one location *east of the tower be representative of the entire eastern (patched) sector? Is the temperature at the set depth the same for the entire eastern sector? The same for western sector. So the conclusion seems a bit too firm.*

This is a good point. The temperature profiles especially in the eastern sector are likely to be patchy. However, disentangling the functional relations of different sub-footprint scale patches can prove impossible. As we expect the higher fluxes from wetter patches we choose to let the temperature measured at wet patch to represent the eastern sector. We will reformulate the conclusion to reflect these caveats.