

## Main

This paper adds data on emissions from peat-lands, contributing with 9 sites with thorough measurement program on which models are made for EF construction. The methods and data processing used are excellence. This study will be of large use for compilation of National Inventory reports, and hopefully making the large emissions from drained peat more visible. Thus laying the ground for emission reductions, by rewetting drained peat areas.

However I find it important to discuss more deep the influence of WT on the flux. A reader can get the faulty impression that mainly the temperature is the controlling factor, however the prerequisite is that the site is drained. This study also point to the need for additional measurements, on sites with more variable fertility and drain levels. Also there is a need to measure N<sub>2</sub>O, which this study did not include.

I find the paper overall interesting and easy to read, why I suggest a minor revision making the text and discussion more clear and fix some small errors.

## Specific

### Abstract

Line 6, Difficult sentence to read.

### 2.3 Environmental monitoring

Line 8-9, Explain what PP System and CPY-4 chamber means.

Soil temperature was recorded at 10 minutes interval, except DP3, where it was hourly intervals. Not clear. How much data gaps?

#### 2.5.1 Field measurements

22. clear acrylic chamber, measuring Reco, must include also photosynthesis and thus NEE? Why not tell?

#### 2.5.2 Flux calculations

For how long time was the chamber closed?

#### 2.5.4 Annual CO<sub>2</sub>-C balance

21. Each 12 month period. How many years? One year each site?

### 2.6 Peat fire emissions

Loose Irish moss peat. How decomposed?

What influence could drying of the peat before combustion have on the result? In nature, peat fires continue, still it is not fully dry. Burning of peat in nature is not only in the surface, but deep down. How could this influence gases produced?

### 3.2.1 Modelling

8. T is the temperature at which respiration reaches zero,... Should it not be  $T_0$ ?

For equations 1-3 I have a reflection. For all these soils draining is the prerequisite for soil decomposing. Thus the water table depth >20cm is of need for these equations to be valid. This is why the effect of temperature becomes important, and only in some cases the WT becomes a limitation.

### 3.4 Emission factors

For clearness I suggest here once again to tell the reader on which variable the EF's are based.

### 3.5 Peat fire emission factors

MCE have not been defined/explained.

MCE typical of smouldering combustion... Reference needed.

### 4.1 Effects of climate

P7509 L3. Table 2 should be Table 3, Please check the numbering of tables and figures!

L4-6. You say this confirms that soil temperature rather than water table is the main driver of emissions. I am not sure this could be said, since a prerequisite for all sites in this study is a WT level of >-20 cm. And for these types of systems, you show the temperature to be the most influential, which is OK if mentioning the prerequisites. This is confirmed by the wetter conditions and thus lower emission in the DP3 site.

L19-. It is not clear how the LAI or PPFD could be drivers for peat decomposition. My suggestion is that the vegetation influences the water content of the soil, by transpiration, making it more aerobic, and thus higher soil CO<sub>2</sub> flux. Thus the sunny days are more important than rainy. This also goes for LAI which also influence transpiration. Could this be discussed?

### 4.3 Peat Characteristics

L10 Interesting that IP4, with C/N lower than 25 had highest emissions. IP2 had similar low C/N however not this high emission. You could have connected the C/N discussion to published similar studies.

### 4.4 Effects of peat extraction...

L11. It is odd,  $R_H$  was only measured at DP1, how could you say it is higher also for DP2 compared to....?

### 4.5 Fire emission factors

L4. Here it is said: ' the importance of understanding the full suite of trace gas emissions from biomass burning, rather than focussing solely on CO<sub>2</sub> and CH<sub>4</sub> emissions.' The question then is: Why did you not include N<sub>2</sub>O in the measurements? In the wetland supplement it is only 4 studies

on which the Tier 1 EF is based, temperate extraction sites. Some discussion on why you did not include this in the measurements would be good.

#### **4.6 Implications...**

L20. Why not say 1.7 t C?

P7515 L1. After '6' I lack the word 'times'.

#### **Figures**

Figure 3 and Figure 5 do not match. For Figure 3c the NEE show a net uptake of C but the Figure 5 shows NEE as loss. How come? Confusing.