General comments

In the discussion paper, the authors compare forest floor photosynthesis (GPPfloor "GEP") and respiration (Rfloor "Rtot") in two growing seasons on hummocks and hollows of pristine and drained parts of a continental ombrotrophic bog. Also ground vegetation and tree stand biomasses and tree stand biomass increments are compared.

The paper provides useful data for the understanding of the effects of improved drainage on the function of mire ecosystems. Considering the vast mire area in Canada and the possible water-level drawdown effect of future climate change, this information is necessary.

The applied measurement and calculation methods are of good scientific quality. The quality of the presentation is good as well, and the use of English language appropriate. Some minor improvements are needed (see specific comments).

The only major problem of the paper is that the authors also make statements about net ecosystem exchange (NEE) and carbon (C) balance, even though not all major components of NEE and C balance are estimated. The lack of components is to some extent admitted, but their importance is not further analyzed. The conclusions on NEE and C balance can well be argued.

NEE is usually defined as the net exchange of CO_2 between ecosystem and atmosphere, and it is the sum of ecosystem gross ecosystem photosynthesis (GEP) and ecosystem respiration (R_{tot}): NEE = GEP + R_{tot} (GEP having negative values). If transparent chambers are used to measure forest floor photosynthesis (GPP_{floor}) and respiration (R_{floor}) as in this study, also tree stand photosynthesis (GPP_{trees}) and respiration of aboveground components (R_{trees_ag}, incl. shoots, branches, stems) are needed for NEE:

NEE = GPP_{floor} + GPP_{trees} + R_{floor} + R_{trees_ag}

In the current paper, the authors use "GEP" and "R_{tot}", while they in fact have estimated GPP_{floor} and R_{floor}. They also use NEE for GPP_{floor} - R_{floor}, while it should be for example forest floor net exchange (NE_{floor}). Further, the authors define C balance by adding the tree stand biomass increment IC_{biom} to forest floor exchange. But, following the definition of NEE and IC_{biom} (= -GPP_{trees} – R_{trees_ag} – R_{root} – L_{trees}):

GPP_{floor} + R_{floor} - IC_{biom} = NEE - ~~GPP_{trees}~~ - ~~R_{trees_ag}~~ + ~~GPP_{trees}~~ + ~~R_{trees_ag}~~ + R_{root} + L_{trees} = NEE+ R_{root} + L_{trees}

This means that what is called C balance in the paper, is actually NEE (source) overestimated by the amount of tree stand litter production and tree root respiration. The normal definition of C balance would be NEE + other C fluxes (methane, leaching, etc.).

I suggest that the authors abandon the rather misleading use of concepts NEE, C balance, GEP and R_{tot}. If statements on those will be included in the paper, a proper analysis on the missing components and discussion on their significance are needed. The tree stand components not measured cannot automatically be considered negligible. In my opinion, the estimated fluxes,

biomasses and biomass increments by themselves can make a good paper, and statements on NEE, C balance, GEP and R_{tot} might even be omitted, or only speculated in the discussion part.

Another terminological issue is that the word "drought" is used when referring to permanent water level drawdown by artificial drainage or to drier conditions due to climate change. Usually, drought refers to a period during which a region has a consistently below average water supply. Climate change will perhaps bring along more frequent droughts, but climate changing to on average more arid or a permanent water table drawdown by improved drainage I would not call drought.

Specific comments

p 15004 r 11. "was drained in 2001" How was it drained? Please, specify for example ditch spacing and depth to give the reader some idea of the drainage intensity.

p 15004 r 21 "These bogs" Were not the control and drained part of the same bog as stated in r 10-11?

p 15005 r 2-3 "Black spruce (Picea mariana) is the most common tree in these bogs." Could you descrive the tree stand in more detail, e.g. tree height, canopy height, stem number, stem volume, projection coverage… You give too little information on the tree stand. The reader cannot get any idea of the possible importance of the tree stand for this ecosystem.

p 15005 r 6 "60×60 cm steel collar" How deep into the soil the collar was inserted? Were many tree roots cut?

p 15006 r 11-13 From this one gets the idea that model 1 was fitted separately for each year and plot, but apparently not, as only one model for each microform and site is presented in table 1? Please clarify!

p 15006 r 24-25 "Two-thirds of the data were used…" How did you select these 1/3 and 2/3, somehow randomly?

p 15007 eqn. 2. Why not exponential form for temperature dependence? It would be good and interesting to state if you did not see an exponential relationship, as it is almost always observed.

p 15007 eqn 2. & Table 2: b has negative values. Does it mean less respiration with deeper water table, or how is the sign convention here? Could you clarify this already in 2.2 where you describe WT measurements.

p 15007 r 18-20 How did you choose which plots to trench?

p 15007 r 21-22 "The trenches were backfilled in reverse order of removal while minimizing disturbances as much as possible." I really don't understand this sentence. Did you dig big holes for the trenching instead of just making a cut with knife/saw for the sheet?

p 15008 r 1-2: Why did you do this? I don't see how it would be necessary, would not removal of ground vegetation rather cause an extra disturbance? Why is it needed for the estimation of tree root respiration?

p 15009 r 3-4: Exactly how did you select these quadrats to ensure representativeness?

p 15009 r 9-10: Please, describe somehow the data, this equation is based on.

p 15010 r 20: Do you have some pre-drainage vegetation data, or what does this "statistically similar" mean?

Would not lower tree biomass but considerably higher tree growth at drained site (3.2, last paragraph) mean that at least the tree stands were not similar then years ago. Do you have data on that?

p 15010 r 21-22: Perhaps more interesting than the significance itself, would be to know the size of the difference! What where the coverages at pristine and drained sites? Was the reduction remarkable?

p 15013 r 8-9: Rather turned into a source?

p 15015 r 20 "net source" Does this equal "source" or is net source something else?

p 15016 r 5 "a flattening of the curve" What "curve" are you talking about?

Fig. 3 "% of tatal"

Fig 4: "without trees" without above ground parts of the trees?