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Biogeosciences Discussions

Interactive comment on "McGill Wetland Model: evaluation of a peatland carbon simulatordeveloped for global assessments" *by* et al.

et al.

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1. In response to McGuire and reviewer 2 we have done the ranking (see our response to reviewer 2) and have included this material in the revision we will submit.

2. McGuire is absolutely correct and we should have noted this temperature – AR sensitivity. I am not sure why we did not see this point - it is very obvious. In the revision we will include the following new paragraph in the discussion:

"In the sensitivity analysis MWM shrub autotrophic respiration was more sensitive to temperature than GPP, leading to a dramatic decrease in NPP when temperature rises. This decrease is likely enough that shrubs would not be maintained. A similar pattern is seen for the moss but it is not as dramatic. This large autotrophic respiration sensitivity

to temperature is not that realistic and from the use of a constant Q10 in equation 12. Realistically, this function should be reach an asymptote - i.e. describe a more Arrenhius type response, and shrub NPP approach zero in temperature stress situations. If this condition were sustained for long periods of time then the evergreen shrubs would be replaced. This demonstrates the need for the inclusion of some form of dynamic vegetation in MWM so when plant functional types are beyond their tolerance range a shift in composition would occur. This is a future development we wish to pursue. However, even with dynamic vegetation there is a need to further develop equation 12. At present there is not a good understanding of the temperature – physiological response of peatland evergreen shrubs behaviour in changing moisture and temperature conditions and experiments and observation for these plants in microcosm studies such as those of Weltzin et al. 2000 are needed. Moss do not have an active vascular mechanism to extract water from the underlying peat so as temperatures increase and they will experience greater water loss and even desiccation and hence can be out competed by other more suitable plant functional types if higher temperatures are sustained (Gerdol et al. 2008)."

and add the following two references to the reference list:

Gerdol, R., Bragazza, L., and Brancaleoni, L. 2008. Heatwave 2003: High summer temperature, rather than experimental fertilization, affects vegetation and CO2 exchange in an alpine bog, New Phytologist, 179, 142-154, 2008.

Weltzin J.F., Pastor, J., Harth, C., Bridgham, S.D., Updegraff, K., and Chapin, C.T. Response of bog and fen plant communities to warming and water-table manipulations, Ecology 81, 3464-3478, 2000.

In the revision we will also adopt all the corrections and editing suggested by McGuire. We thank him for his careful attention in reading our manuscript.

Interactive comment on Biogeosciences Discuss., 5, 1689, 2008.