**Geoscientific
Model Development
Discussions**

Interactive
Comment

Interactive comment on "PEATBOG: a biogeochemical model for analyzing coupled carbon and nitrogen dynamics in northern peatlands" *by* Y. Wu and C. Blodau

Anonymous Referee #2

General comments

The paper extensively describes a new model that aims at analyzing carbon (C) and nitrogen (N) cycling in peatlands in relation to elevated nitrogen deposition and climate change. The model consists of 4 submodels based on existing models and includes methane emission and export of dissolved C and N. The paper is generally well written and the schematic figures give insight in the model setup. I do not have much comments on the model itself or the results. My main concern is that the scope of the model (carbon and nitrogen pools and fluxes and their sensitivities to N availability and climate change, i.e. relatively long-term changes) is not much taken into account

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when evaluating and discussing the model. In the evaluation the emphasis is on daily C fluxes. The model simulates the seasonal developments based on daily fluxes quite well, however it would be more interesting to see whether the model can also simulate the year-to-year variation in annual fluxes. Another issue is how the model takes the generally low decomposition rate of Sphagnum moss into account, which leads to over-representation of Sphagnum remains in the peat (e.g. Clymo papers). It is not clear what the influence of the PFTs is on the decomposition rates, which might be relevant for long-term simulations.

Specific comments

p.1625, l.13 error of measured(?) GPP? Is the unit g CO2 (as in line 1) or g C m-2 d-1?

p.1629 Details of the sensitivity analyses are missing. What changes were applied to the environmental drives and other parameters? This is important to know when you state that some fluxes are less sensitive to precipitation than to temperature.

p.1630, l.6-10 How come that shrubs benefit from increases in precipitation and are there observations that support this? It is counterintuitive as shrubs generally grow on drier positions within peatlands.

p.1632, l.7 Please indicate what kpotL and kpotR are.

p.1633, l.2 Fig. 11f instead of 11d.

p.1634, l.4-5 Where do I see that the trends in interannual variation of GPP with precipitation and temperature were met? In the clouds of daily values I find it difficult to see whether the simulations match the observations. It would be interesting to have the comparison of summer and/or annual GPP over the years in a figure.

p.1634, l.9 32 to 85 g C m-2 year-1 instead of day-1?

p.1634, from l.22 This discussion seems less relevant to me.

p.1640, l.21 Please repeat or summarize the objectives outlined earlier.

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p.1670 Wccap: g H2O g dry mass-1

p.1670 Crt,subs,j: Root substrate instead of structural, the same in the following two lines

p.1672 rRMstem,j: Stem instead of Leaf

p.1673 rhoN,j: resistance parameter . . . of substrate N instead of C

p.1675 fracN2fixmoss: value is in Gram column instead of Moss column

p.1676 Conf.: 1 = low, 3 = high confidence?

p.1677 What model output is compared: daily values, annual values, overall average? What is the unit of the values, e.g. relative change per degree Celsius? Kpot = kCpot in Table 4?

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