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Interactive comment on “Global-scale pattern of peatland *Sphagnum* growth driven by photosynthetically active radiation and growing season length” by J. Loisel et al.

J. Loisel et al.

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Anonymous Referee #2 (9, C699–C701, 2012)

GENERAL COMMENTS FROM REVIEWER: This very well written discussion paper analyses how *Sphagnum* growth relates to bioclimatic variation at the global scale. This is a very important topic as these peat mosses are responsible for long-term carbon sequestration in peatlands, as described in an excellent introduction. The choices the authors made regarding data collection and analysis are well argued. I agree with the focus on two well-studied species and two integrated bioclimatic variables. However, interpretation of the results is not easy and poorly discussed, see specific comments

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below. PAR0, the variable that most explains Sphagnum growth at the global scale, represents a mixture of latitude, growing season length (defined by temperature) and cloudiness, which does not necessarily increase with global warming, as assumed in the abstract. The analysis described in this paper is interesting and deserves publication after more careful interpretation of the results.

SPECIFIC COMMENT 1 FROM REVIEWER: p.2170, l.13 temperature is not included in PAR0, except for delineating the length of the growing season, so I suggest to remove temperature in this sentence.

RESPONSE: The reviewer is right, so we did remove 'temperature' from the sentence, as well as in other sentences where we mentioned a temperature effect on moss growth.

SPECIFIC COMMENT 2 FROM REVIEWER: p.2175, l.4 I would prefer height growth over length growth as the cranked wire method measures height increment. Length growth (of individual shoots) can be larger as the moss not always grows straight upward.

RESPONSE: Acknowledged. We replaced 'length growth' by 'height growth' throughout the text.

SPECIFIC COMMENT 3 FROM REVIEWER: p.2178-2179 Not necessary to repeat the F, R2 and p values, they are in the tables.

RESPONSE: While it is true that the statistical significance of the relationships we presented are shown in tables, we prefer leaving the F, R2 and p values in the text also as it allows the readers to quickly and easily assess the strength of these relationships.

SPECIFIC COMMENT 4 FROM REVIEWER: p.2179, l.14 Table 3 does not include the explained variance for the full multiple model.

RESPONSE: In Table 3, we only presented the variance of $PAR0 * P/Eq$ for the continental sites (and not that of the maritime sites) because P/Eq is only significantly related

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to moss growth in continental settings. It would not be useful to present the multiple regression model for the maritime sites as P/Eq is not a significant independent variable.

SPECIFIC COMMENT 5 FROM REVIEWER: p.2180, l.10-16 Could the relationship with PAR0 be partly a species effect? At least in Europe the faster growing *S. magellanicum* has a more southern distribution than *S. fuscum*. Are the relationships still there if you test for the species separately? Or is the species effect perhaps a PAR0 effect? You could test this in an analysis of covariance.

RESPONSE: We tested for the species effect on PAR0 and Sphagnum productivity using a univariate analysis of variance with Sphagnum species as a covariate. The result indicated a non-significant effect of species on productivity ($p = 0.1$).

SPECIFIC COMMENT 6 FROM REVIEWER: p.2181, l.21 Is the higher PAR0 at continental sites related to the lower latitude or less cloudiness? Here it would be good to include F and p values, as it is not somewhere else.

RESPONSE: As latitude and cloudiness are both part of PAR0, it is impossible to isolate their respective effects. We did add the p value as well as additional statistical information (mean, standard error).

SPECIFIC COMMENT 7 FROM REVIEWER: p.2181, l.26 ... the short duration of ... Why would the maritime regions have a thinner snow cover, assuming they have more precipitation?

RESPONSE: We speculated that the maritime regions might have a thin snow cover because temperatures are much more temperate in these regions than under continental settings, meaning that snow may melt during winter time (when $T > 0^{\circ}\text{C}$) or precipitation may fall as rain. We removed this sentence from the main text.

SPECIFIC COMMENT 8 FROM REVIEWER: p.2195 y-axis label: cm instead of mm yr⁻¹

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RESPONSE: Thank you for pointing out that typo on Fig. 3. We have changed 'mm yr⁻¹' to 'cm yr⁻¹'.

SPECIFIC COMMENT 9 FROM REVIEWER: p.2196 Very interesting figure

SPECIFIC COMMENT 10 FROM REVIEWER: Appendix Is it possible to sort the studies from high to low PAR0, so that it is possible to see which are the high PAR0 sites with the high growth rates? Gerold should be Gerdol. Which are the high-elevation sites?

RESPONSE: As suggested, we have sorted the sites from low to high PAR0. We have also changed 'Gerold' for 'Gerdol'. High-elevation sites are indicated by * in the Table, and they are sites located at least 1000 m above sea level.

Interactive comment on Biogeosciences Discuss., 9, 2169, 2012.

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9, C1414–C1417, 2012

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