**Biogeosciences
Discussions**

Interactive comment on "Soil respiration compartments on an aging managed heathland: can model selection procedures contribute to our understanding of ecosystem processes?" *by* G. R. Kopittke et al.

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General comments

Kopittke et al. study statistical models of soil respiration and soil heterotrophic respiration at a temperate heathland site. In addition to numerous already existing soil respiration modeling studies they make explicit the usually implicit process of model building and model validation. This is a significant contribution to the biogeochemistry and soil carbon community. Especially the usage of two levels of validation plots and

periods is exemplary for future designs of experimental setups.

The analysis is sound and I can follow all the procedure, because they give all the details. However this high level of detail needs to be balanced with still missing clarity of the main points and conclusion.

What did we really learn from this model selection?

Since the model selection process seems to be the part most contributing to community understanding and knowledge, the study would greatly benefit by a comparison to the often encountered process that uses only the calibration data or uses all the data as calibration data. Do the models and conclusions change? What are the reasons in favor or against cross validation to make usage of the full amount of data? Would conclusions change if only fewer measurements were available?

Together with focusing the paper, the paper would also benefit from shortening. Can parts of the methods be moved to appendix without compromising the general understandability? Results can be shortened by e.g. stating that for total soil respiration LMM, LMM2 and Selsted models performed much worse than the GLMM models and hence their detailed model variant results do not need to be reported and discussed.

Specific comments

With some background on forest soil carbon dynamics I at once miss the incorporation of seasonal variation of available substrate for heterotrophic respiration and hence seasonal changes in parameter R_0 in the model variants. Is litter production in line with average rate of decomposition throughout the year in the heathland?

The study discusses sequestration without presenting other fluxes such as net ecosystem production or losses other than respiration. Please, present those other fluxes or omit the discussion or present it only shortly in an outlook (but not in abstract).

How general is the result of no further information of plant variables in addition to temperature for soil respiration?

The age classes are not randomized. I miss a short discussion on whether and which other covariates can cause differences between the young and the other age classes.

Please, guide the reader a bit more on the usage of log-link function and the GLMM approach. E.g: in the model-method section "By using the log-link function we study the log of the respiration and hence the model with exponential terms becomes a linear model. "

To appreciate the model adequacy a plot of the residuals vs temperature and/or time and a quantile-quantile plot of the residuals and the Poission distribution would be helpful.

Technical comments

P16241 L2 second largest flux <after XX?> in the <global?> carbon cycle

P16242 L2 use <mostly> recently produced

P16254 L15 generalized <linear> mixed effects model

Table 4 lacks information on residual variance and variance of the random effects. I suggest to also report the coefficients of almost as good models (with P or M as a predictors respectively).

P16255 Please report the values of Max Biomass and Maximum P_G. This will help meta-analysis that compare dimensional model coefficients (if model coefficients are reported in Table 4)

P16259 To my opinion the p values can be omitted, if they are not close to the significance level.

P16263 Can the RMSE values be presented in a Table? The text is really hard to read. How about discussing the the observation of overfitting (L 11ff) more prominently?

Fig9: Are these predictions of the population or the groups/plots? Get the figures

confusing if you indicate different groups by different colour or symbols?