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***Interactive comment on* “Seasonality in a boreal forest ecosystem affects the use of soil temperature and moisture as predictors of soil CO₂ efflux” by S. M. Niinistö et al.**

Anonymous Referee #1

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This manuscript deals on the interesting and “always imperative” question of factors influencing soil C efflux, and thus indirectly also SOM decomposition as well as root respiration, among many other factors. It also tries to unravel the question of temperature and moisture effects on soil C efflux and which of both influences the process to what extent. Since these factors seldom occur isolated, this is not easy in field experiments, and sometimes, distinct conditions, occurring accidentally, can help here, as happened also here. Generally, it was a delight to read this paper.

Although the data of the manuscript appear to be already over 10 years old (why not published earlier?), they are not “old” per se, although the hottest debate of soil C

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efflux seemed to have faded already. The data, calculations results and conclusions are all sound and well structured. The description of experiments and calculations are sufficiently complete. The language is very fluent and precise.

More specific comments: p 2 | 11: what do the authors mean by spring and early summer? Are they not snow-free period? (also page 16 line 14) p 4 | 1: six warmest months: to what climate is this confined? This period seems to cover the whole growing season, so you do not expect too much C gain outside it? p 4 | 11ff: did you study also other factors, in order to be able to make hypotheses? p 4 | 25: I think this is nowadays University of Eastern Finland? p5 | 13 to 18: are these background data from another study or did you determine these? How about the different tree densities of the plots, how much could they have affected the variability of the results? p 6 | 13: could you be more precise when describing the stands for model evaluation? p 6 | 15: you winter measurements are based on only a few points, not covering the whole season, do you think this to be problematic? p 6 | 17: you cleared the snow prior the measurements in winter. Could this have had any decreasing effects on soil temperatures, and thus affected the winter results? p 6 | 27: you measured the soil temperatures rather at the surface. I guess that this might have influenced your results in the way that late season efflux is higher than early season efflux, since the soil column is still cold in spring, irrespective of similar temperatures of the organic layer at the top (see also page 18 lines 17f) You are talking about the weather station and the Vaisala station. Whom do they belong? Soil moisture measurements: how relevant is it to measure outside your plots, i.e. have you some proof that there is minimal spatial variability? p 8 | 25: are degree days and temperature sum the same thing? p 9 | 5f: is this normal procedure? p 10 | 28: were the collars changed between years? p 15: comparison to other studies: do you know of effects of tree species, age and soil nutrient conditions on soil C efflux? p 17 2f: these bands were not mentioned earlier, were they part of you experimental setup? p 22 I agree with you, that some index of root biomass or root growth would be valuable to add to the model. p 23 | 7: although humid boreal conditions: your sites seemed to be rather dry? p 36: Fig 4: to my eyes, the solid black lines are not linear?

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p 37: Fig. 5A: the values seem to form a circle starting from May and ending in Oct, which is similar to May

Interactive comment on Biogeosciences Discuss., 8, 2811, 2011.

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