

Interactive comment on “Tree proximity affects soil respiration dynamics in a coastal temperate deciduous forest” by Stephanie C. Pennington et al.

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- 1 "The manuscript entitled “Tree proximity affects soil respiration dynamics in a coastal temperate deciduous forest” is in fact addressing three different questions: (1) tree proximity and soil respiration, (2) temperature sensitivity, and (3) required sampling effort. Only the first one is clearly reflected in the title."**

This is a great point, also pointed out by Reviewer 2. We will change the title to something that reflects the overall R_s variability in the context of localized basal area

C1

affect/vegetation. For example, Reviewer 2 suggested “localized basal area affects soil respiration dynamics in a coastal temperate deciduous forest”, which we agree would work better than the current title.

- 2 "These three questions are relevant and within the scope of BG, but they are not novel and there is no novel concept, idea or tool that emerged for this study. This is an additional set of data (a case study). (1) The approach of linearly connecting the basal area of trees to a fixed distance (5 m) and ground respiration is simplistic. The distance at which an individual tree influenced soil respiration is probably dependent on the size of this tree. In other words, biggest trees are expected to have a stronger influence than smaller trees."**

While aspects of the relationship between R_s and basal area have been previously studied, the issue is hardly closed; there is little consensus on the strength and spatial patterns of this effect, for example. We believe that the novelty of this study lies in its examination of how basal area affects the spatial variability of R_s in different phenological seasons and soil moisture conditions. We will explain this more clearly in the revised manuscript.

C2

- 3 "There are several (many papers) relating addressing the effect of tree size and proximity on soil respiration that are not cited in this manuscript. Among them: Fang C, Moncrieff JB, Gholz HL, Clark KL (1998) Soil CO₂ efflux and its spatial variation in a Florida slash pine plantation. *Plant Soil* 205:135–146. doi:10.1023/A:1004304309827 Metcalfe DB, Meir P, Aragão LEOC, Malhi Y, da Costa ACL, Braga A, Gonçalves PHL, de Athaydes J, de Almeida SS, Williams M (2007) Factors controlling spatio-temporal variation in carbon dioxide efflux from surface litter, roots, and soil organic matter at four rain forest sites in the eastern Amazon: PARTITIONING AMAZON SOIL RESPIRATION. *J Geophys Res* 112. doi:10.1029/2007JG000443 Katayama A, Kume T, Komatsu H, Ohashi M, Nakagawa M, Yamashita M, Otsuki K, Suzuki M, Kumagai T (2009) Effect of forest structure on the spatial variation in soil respiration in a Bornean tropical rainforest. *Agric For Meteorol* 149:1666–1673. doi:10.1016/j.agrformet.2009.05.007 Brelvi L, Ponton S, Almeraz T, Bonal D, Epron D (2011) Does spatial distribution of tree size account for spatial variation in soil respiration in a tropical forest? *Plant and Soil* 347:293–303. doi:10.1007/s11104-011-0848-1 Schwendenmann L, Macinnis-Ng C (2016) Soil CO₂ efflux in an old-growth southern conifer forest (*Agathis australis*) – magnitude, components and controls. *SOIL* 2:403–419. doi:10.5194/soil-2-403-2016 Reading these papers (but the list is not limitative) would have given way to analyze more finely the results, especially the last two."

We appreciate these suggestions, and agree that additional citation of the literature would strengthen the discussion.

C3

- 4 "(2) The observation that autotrophic respiration is more sensitive to temperature than heterotrophic respiration is also confirmative of many studies. Note that the paper Aguilos et al 2011 that is cited when discussing this point has not been accepted for publication in *Biogeoscience*, so the citation is wrong. Note that the citation Wei et al is incorrect: should be Wei et al (doi:10.1016/j.soilbio.2010.04.013)."

Thank you for catching these mistakes, which will be fixed.

- 5 "The discussion of this fact is rather poor and miss one of the most important drivers of the apparent temperature sensitivity of RA: phenology. This may be important in the present study since soil respiration was measured over a full year and species are deciduous. Among many other sources, this has been discussed in: Epron D, Le Dantec V, Dufrene E, Granier A (2001) Seasonal dynamics of soil carbon dioxide efflux and simulated rhizosphere respiration in a beech forest. *Tree Physiology* 21:145–152. doi:10.1093/treephys/21.2-3.145 Ruehr NK, Buchmann N (2010) Soil respiration fluxes in a temperate mixed forest: seasonality and temperature sensitivities differ among microbial and root-rhizosphere respiration. *Tree Physiol* 30:165–176."

We agree, a discussion of phenological influence will help to explain the high spatial variability at this site and temperature sensitivity found.

C4

- 6 **"(3) The third point deals with estimate the number of samples required for a robust estimate of the Rs. This has also been done plenty of time so there are two options: use it as a description of the site in the materials and methods section or do not only compare with other estimates but discuss more the reason why the number of samples required is higher in this study than in many others, thus why spatial variability is higher. Four lines is not enough. The discussion now is poor."**

Thank you for pointing this out. While we agree the sample requirement section should be better addressed, we propose to leave this in the discussion for three reasons. The spatial variability could be a product of 1) the topographic variability at the study site, which led some collars to be better drained than others, 2) the record rainfall year in 2018, and 3) species diversity. All which could contribute to the high variability and thus high number of samples required. We will expand beyond the original four lines of text to better explain potential reasons why this sample requirement is higher than other studies/sites.

C5

- 7 **"In conclusion, while the manuscript is based on an interesting data set obtained with valid methods, the discussion is not strong enough to reach substantial conclusions. A little more time would have been needed, maybe. One may expect the last sentence of the abstract to be the core of the discussion. The state of the art in the introduction should also be reinforced by looking more in detail in the huge relevant literature. The argument that no study has examined the influences of trees on spatial variation of Rs in the Chesapeake Bay watershed can be used for millions of watersheds in the world. This sentence should be removed."**

We agree, and will remove this sentence.

8 **OVERALL RESPONSE:**

Thank you for your review. Overall, we agree that (1) the title should be reconsidered to include the entire scope of the study (also pointed out by Review 2), (2) better acknowledgement of current literature will give the motivation more context and (3) a more in-depth consideration of phenology will strengthen the discussion. However, while the relationship between Rs and basal area has been previously cited, we believe the novelty of this study lies in the examination of how vegetation influences the spatial variability in forest ecosystems.

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C6