Biogeosciences Discuss.,
doi:10.5194/bg-2017-79-RC2, 2017

Biogeosciences Discussions

Interactive comment on "Spatially variable soil water repellency enhances soil respiration rates (CO_2 efflux)" *by* Emilia Urbanek and Stefan H. Doerr

Anonymous Referee #2

Received and published: 5 May 2017

The manuscript 'Spatially available soil water repellency enhances soil respiration rates (CO2 efflux)' by Urbanek and Doerr describes a 3 year study investigating the effect of soil moisture and soil water repellency on soil respiration. Two study sites with similar soil type were chosen in England. Plots of vegetated and bare soil were measured for soil moisture, soil temperature and soil water repellency. The authors observed temporal variability in soil water repellency during the year. They aim to link the observed soil water repellency to soil water and temperature, as well as to soil respiration. Lastly, the authors present a theoretical framework to explain the observed link between soil moisture and soil respiration.

The study is interesting and addresses an interesting phenomenon: the effect of soil

moisture repellency on soil respiration. The authors present a lot of data, which I find overwhelming. In my opinion, the manuscript would benefit from focusing, especially of the results section. Data that are not crucial for the explanation could go into supplementary information. This would guaranty that it is not an information overflow. General questions that need clarification:

- The experimental setup as described in Figure 1 and Table 1: I have a hard time following why bracken and vegetated soil was measured, and also what the information on bare soil and vegetation soil was used for. E.g. Figure 4 presents data from which plots exactly? And Figure 5 displays forest and grassland plots in vegetated and bare plots but where are the bracken? Or is bracken vegetated? Please clarify which data were used when and why in a concise way.

- I think I miss an explanation why you chose to use temperature and soil moisture classes. It seems somewhat arbitrary at the moment.

- Figure 9: I understand the information in the figure and it seems a good explanation for the observed soil respiration patterns. Though, I assume the basis for this figure is the information on WTPT (Figure 4). But I don't understand how this information, which is based on WDPT tells you about flow paths. Please clarify. Comments to the Figures:

Figure 2 - This figure is really busy and the shadings in different directions and colours are overwhelming. Consider putting the rainfall data in a table. Or/and present the temperature curves as mean +/- standard deviation as they are following each other closely anyway.

Figure 3 - Suggest to move this graph to a supplement. I don't see a direct connection to the study other than that it presents the expected variation in soil moisture and soil temperature during the years.

Figure 4 - Where are your error bars on the barplots? I assume it is the means of

replicated samples?

Figure 5 - The presentation of soil respiration is challenging for the eye. Why not present boxplots? Picking out the means is very difficult in this way. Some sampling dates seem to miss the mean altogether. Same as with Figure 3, I think this information could go into a supplement.

Figures 6 following - You could combine figures 6, 7 and 8 to one figure with 3 panels. For figure 6, did you use data from bare and vegetated plots? How did you combine the soil respiration data? For figure 7, did you pool the forest and grassland data? Figure 8: how do you calculate the SWR distribution and what exactly does it mean? You mention it on page 8 line 8 but it is not clear to me how you calculate the distribution.

Figures 7 and 8: - Figure 7 shows soil moisture, Figure 8 shows SWR. To me, the information gained from both plots looks similar. What is the new information in Figure 8? I think I don't understand why you recommend the measurement of SWR (which is much more effort than SWC) if the same information can be gained from the measurement of SWC.

Specific comments: - Page2 line2: the reference to Karhu et al is wrong. Karhu et al themselves cite the reference that you need here. - Page 20 line17: where do you document the significant results mentioned? - Page 22 lines 18-20: what could the biological controls be? - Page 23 lines 12-14: reference to Figure 4: I can't related the information in this sentence to any information presented in Figure 4, please clarify. - Figure 9: the title of the Figure is misleading: The figure does not show soil CO2 efflux responses. It rather shows a theoretical framework of soil water distribution due to SWR.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2017-79, 2017.