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Interactive comment on “

Temporal and spatial variations of soil carbon dioxide, methane, and nitrous oxide fluxes in a Southeast Asian tropical rainforest” by M. Itoh et al.

Anonymous Referee #2

Received and published: 29 October 2010

General comments:

This paper describes an interesting study of controls on greenhouse gas fluxes in a Southeast Asian rainforest. I had a number of comments but overall the paper was clear and the data seemed sound. I would suggest the authors develop some specific hypotheses to focus the paper. For instance why do the authors expect soil N concentrations to affect soil CO₂ efflux? The discussion lacked some of these explanations

C3535

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Interactive Discussion

Discussion Paper



and often repeated the results section. Consequently I think the discussion can be shortened a bit and focus more on the processes and implications. The authors calculated WFPS but it was only mentioned in the last part of the discussion. Perhaps the description in the methods can be shortened. With regards to the Tables I would suggest that the authors use the more conventional significance levels of $p < 0.05$, 0.01, and 0.001, i.e. skip the 0.005 level. Instead, I would encourage the authors to indicate $p < 0.1$ significance as well. Sometimes the authors mention that in the text but it would be good to indicate that in the tables as well. If the level is < 0.1 it means that there still is a 90% possibility that there are significant effects. You could also consider putting numbers in bold that are significant at the $p < 0.05$ level without mentioning the actual levels and put p values < 0.1 in brackets.

Page 6850, Line 1: Consider adding a reference. Page 6850, Line 4: replace 'global warming gases' by 'greenhouse gases'. Page 6850, Line 15: 'drought stress' may be a bit strong here since you are still dealing with an ecosystem that receives several meters of rain per year. Page 6850, Line 16-18: That sentence looks a bit contradictory to me. Page 6850, Line 19: add 'when comparing Amazonian and SE Asian rainforests' at the end of the sentence. Page 6850, Line 21: add 'the' before 'net forest...'. Page 6850, Line 27: not sure if the word 'depletion' is the right word here. This whole sentence is a bit unclear. Page 6851, Line 25: Not sure if 'bipolar' is the right word. Also it is not explained what this means. Page 6851, Line 26: There are several studies that tried to link soil CO₂ efflux to CO₂ concentrations in the soil and these weren't always successful depending on the environment. I'd suggest looking at some of these. I think in general, biological processes are considered to be more important in regulating trace gas fluxes. Also, what chemical properties do you consider to be important in regulating CO₂ fluxes? It may be good to expand on this section a little bit since it is a critical part of the paper and provides justification for measuring soil gas concentrations. Page 6852, Line 27: What is the average seasonal/annual temperature? Page 6853, Line 15-16: What was the temperature variation during this period? Were the collars always measured in the same order? If so, there could be

Interactive
Comment

potentially confounding factors of having certain collars being measured only when it is cool in the mornings whereas others are measured when it is warmer. It probably does not affect the analysis too much except for introducing extra variability. Perhaps the authors can see if the collars measured in the morning show consistently different values compared to those measured in the afternoon. Page 6854, Line 6-12: What was the accumulation time for CH₄ and N₂O? Was it also 90s similar to CO₂? Later you mention that samples were taken within 30 minutes. If so, to measure all collars must have taken at least 14 hours or so. This section is a bit unclear. Page 6855, Line 22: What do you mean by 'very close'? Be more specific. Page 6856, Line 3: Why did you measure soil pH? It didn't look like it was being used in the rest of the paper. Consider deleting this. Page 6856, Line 18-21: Why did you use this procedure? By moving the collars you probably introduced more variability. Of course you can't change this but it is not ideal in my mind. Page 6857, Line 10: Replace 'obeys' by 'displays'. Page 6858, Line 10: Why did you calculate WFPS? It didn't seem to be used anywhere else in the paper. Page 6858, Line 13: It would be good to add a section on how the correlations between gas fluxes and the various variables were calculated. Page 6859, Line 10: Change title to 'Environmental conditions' or something similar. Page 6859, Line 22-26: I'd suggest moving this part to the methods section. Page 6860, Line 3: Change title to 'Spatial patterns'. Page 6860, Line 6-10: Move to the methods section. Page 6860, Line 13-14: This was unclear to me. Page 6860, Line 16: This does not appear to be the case for point 9 according to Fig 3e. Page 6860, Line 21-22: Would you expect N concentrations to vary temporally? Also it appears you only measured N concentrations once so the term 'temporally averaged' is unnecessary. Page 6861-6862: I would consider the present the correlation sin a separate section rather than present them within section dealing with the individual gases. Page 6861, Line 5: It is rather unusual to see CO₂ concentrations decrease with increasing depth. This would imply that CO₂ would diffuse into the subsoil. This did not make sense to me. It may be worth checking to see if concentrations at 30 and 50 cm are really different. Page 6861, Line 13-14: Move to the methods section. Page 6863, Line 23-25: I would be

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careful with this statement since the higher soil CO₂ concentrations may have been caused by limited diffusion, while higher CO₂ efflux may have been caused by higher microbial activity at the soil surface. Page 6864, Line 3-4: What was the P value? If the P value was around 0.1 I could buy this but if it was higher this may be a dangerous statement. Page 6864, Line 6-7: Why do you make this statement? Please expand. Page 6864, Line 15: Replace 'Reiner' by 'Reiners'. Page 6865, Line 1-2: See comment Page 6863, Line 23-25. Page 6865, Line 4-8: This is a bit vague. I'm not sure what you are trying to say here. Based on Table 3 API30 is a very good predictor of N₂O flux. Unless you can expand on this I would eliminate this section. Page 6865, Line 18: I assume you mean Fig 5b. Page 6866, Line 12-13: See comment Page 6863, Line 23-25. Page 6866, Line 13-14: Not sure I understand this sentence. Perhaps rewrite this sentence to 'Spatial patterns were dominated by the presence of hotspots.' Page 6868, Line 2: Can you provide a reference for this statement?

Interactive comment on Biogeosciences Discuss., 7, 6847, 2010.

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7, C3535–C3538, 2010

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C3538

