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Interactive comment on "Effects of nitrogen and phosphorus additions on nitrous oxide emission in a nitrogen-rich and two nitrogen-limited tropical forests" *by* M. H. Zheng et al.

Anonymous Referee #3

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This paper studied the effects of N and P additions on N2O emission in two tropical forest soils. The authors claimed that this is the first study to exam how N and P interact to control soil N2O emission in tropical forests. As far as I can tell, the results are sound, but the conclusions might need to be further discussed. I also have several technical comments, detailed below, that should be addressed prior to publication.

1) In page 6, lines 7-9, it shows that natural atmospheric N deposition is $\sim$ 50 kg N ha-1 yr-1 for this study region. Why did you add so much N (150 kg N ha-1 yr-1) for your experiments?

2) In the introduction part, it would be useful to give some information about the differences between old-growth forest and younger forest, such as soil development, plant

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Discussion paper

N utilization, soil N cycling, trees root. . ..

3) In page 9, lines 8-9, 'soil WFPS decreased in summer'. But in page 6, lines 4-5, you wrote 75% of precipitation falls from March to August. Why is that? Do you have the rainfall data?

4) In page 12, lines 5-6, although higher MBC in old-growth forest soil, I am still not sure about the higher activity of (de)nitrifying bacteria as the low soil pH ($\sim$ 4.0). Chemodenitrification or other chemical processes might be more important than (de)nitrification.

5) In page 14, lines 15-16, you only measured N2O emissions and nitrate leaching, but didn't measure other gases lost (NH3, NO, HONO, NO2) and also didn't measure nitrogen utilization by plant. Thus, it is hard to say that 'N continue to be utilized and was not lost . . ..', and also hard to support the hypothesis in the following sentence.

6) One way to check the mechanism of P alleviation of N2O emissions is to compare soil microbial community in Control and P addition treatments. This might give you a clue in microbiological level.

7) For my understanding, your control experiment is under natural atmospheric N deposition? Compared with control treatment, P addition treatment didn't decrease N2O flux (Fig. 3 and 4). So it is not possible to get the conclusion that 'P fertilization can be used to reduce soil N2O emission in N-rich forests under atmospheric N deposition'. Even P addition treatment decreased N2O flux compared with high N (150 kg N ha-1 yr-1) addition treatment, how do you know P addition will also decrease N2O flux under low N addition or atmospheric N deposition (50 kg N ha-1 yr-1)? Especially you explained that N2O emissions are caused by high N content or N-rich soil.

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