

Interactive
Comment

Interactive comment on “Effects of multiple environmental factors on CO₂ emission and CH₄ uptake from old-growth forest soils” by H. Fang et al.

Anonymous Referee #1

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This report focused on the multiple environmental factors such as temperature, moisture and nitrogen in soil, on CO₂ emission and CH₄ uptake from old-growth forest soils, where climate condition was different. This focus was very interested for readers and valuable to assess the GHG dynamics in terrestrial ecosystems. However, there are some considerable shortcomings in the discussion. So, the authors should make major revisions according to the following comments.

1. In the abstract, the authors mentioned that soil CO₂ flux in the old-growth forests were mainly driven by soil temperature (P7822, L12). I agreed with the opinion. But, I can't agree with the speculation that CO₂ fluxes will increase with increase in air

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temperature (P7835, L5). This speculation is a just speculation, not scientific. This study was conducted in various climate condition from boreal to tropical zone. When air temperature will be changed, the response of soil temperature will be different among zone. Not only scientist but also many people is concerned with an increase in carbon emission from soils due to an increase in air temperature. Therefore, the speculation should be deleted.

2. I agreed with the result that there were relationships between soil C fluxes and mineral N (Fig. 6). However, I can't agree the authors' opinion that increasing in N depositon in eastern China would increase soil CO₂ emission but decrease soil CH₄ uptake in the old-growth forests (P7822, L21). In this study, CH₄ uptake was highest in subtropical forest (Table 2), where N deposition was highest (Table 1). How can you explain this result? In addition, it is necessary more explanation to assess the effect of mineral N on soil C flux in the discussion (4.3&4.4). The authors mentioned that NO₃ promote CO₂ emission and NH₄ inhibit CH₄ uptake (P7822, L16). In fact, figure 6 showed the clear relationship between soil C flux and mineral N. However, NH₄ is consumed and NO₃ is produced via nitrification process, and NO₃ is consumed via denitrification process. Generally, nitrification rate is high under high temperature and mesic condition. These conditions would enhance a decomposition of soil organism and CO₂ emission from soil. The authors need to explain the considerable mechanism. As for CH₄, the authors mentioned CH₄ uptake was inhibited due to both the competitive and toxic inhibition (P7822, L19). But, in the subtropical forest soil, it is an acceptable explanation that high CH₄ uptake was observed due to that NH₄ oxidizers can oxidize CH₄. Anyway, the effect of mineral N on soil C flux should be discussed based on various possibilities. Specific comments P7824, L17: The study sites were classified in boreal, temperate, subtropical, and tropical zone. However, I think the temperate site should be classified cool temperate zone, not temperate forest. Because, mean annual temperature and precipitation (Table 1) are too low to be classified into temperate forest. In addition, soil was relatively wet due to the soil moisture data and vegetation (*Fraxinus mandshurica*), so that, this forest was not ordinal temperate for-

est. As same as temperate region, according to figure 1, the tropical region is too cool to regard as the tropical. Are the classification correct?

P7825, L8: The authors mentioned soil classification, but the classification was very old. Soil classification was very important information. If the authors want to refer FAO/UNESCO taxonomy, soil classification should be conducted due to WRB 2006.

P7826, L7: The measurement season was separated growing and non-growing season. But I think that the separation is not suitable for subtropical and tropical region. If the classification of subtropical and tropical region was incorrect, the authors can use growing and non-growing season, or summer and winter.

Technical comments CO₂ and CH₄ flux: The authors use various words to express CO₂ and CH₄ flux. For example, CO₂ emission, CO₂ exchange, soil CO₂ flux, CO₂ efflux etc. . . In discussion, sometimes, it is correct to use CO₂ emission or CH₄ uptake, but the authors should take care of how to use the terms.

Table 1: Temperature mixed forest > temperate mixed forest. It is better to write forest vegetation name not Latin name, briefly. For example, larch in boreal forest. What is the measurement depth or range of soil texture, Total N, C/N and soil pH? Please write down as SOC density like as “0-20 cm”.

Table 2 & Fig. 2: Unit of soil moisture is not “%” but “m³ m⁻³”. Please use SI unit.

Reference: the authors cited “Hashimoto et al. 2004” (P7831 ,L13), but it is not showed in the reference list. Add in the list or delete from the text.

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