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Biogeosciences Discussions

Interactive comment on "Soil organic carbon (SOC) accumulation in rice paddies under long-term agro-ecosystem experiments in southern China – VI. Changes in microbial community structure and respiratory activity" *by* D. Liu et al.

Anonymous Referee #1

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This manuscript evaluates the role of microorganisms in C sequestration in rice paddies. I consider topic to be of high importance for understanding the mechanisms that regulate capacity of agricultural soils to store and release C. This paper addresses this question in the context of specific fertilization regimes from long-term agro-ecosystem experiments, which have been in place since the lat 1980's.

The main concern for this paper is that language is not fluent and precise, making the

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science difficult to evaluate. In addition there are many errors that suggest the paper has not been carefully proofread by the authors.

The main finding of the paper is that SOC accumulation correlated with microbial biomass and with increasing fungal dominance. This occurred in plots receiving "compound chemical fertilization" or "combined organic and inorganic fertilization". The discussion does not adequately address the relationship between the specific fertilization regimes and C cycling. For example, the relationship between microbial biomass and SOC content is not adequately discussed in the context of the long-term fertilization regimes, which is the novel aspect of the experimental design. A threshold for the specific respiratory activity was identified at 20 g SOC/kg, but this was not discussed in the context of fertilization regimes or specific biological stabilizing mechanisms. Similarly the finding that both inorganic fertilization and organic + inorganic fertilization resulted in decreased specific respiratory activity needs to be discussed in more detail in the context of the specific treatments.

1. In the hypotheses, "microbial community and functioning" needs be more specific, for example, microbial community structure (culturable fungal:bacterial ratio) and microbial respiration. The ideas on line 13-15 in this paragraph are quite good, but the sentence structure is awkward.

2. The experimental design needs clarification. What is "CK" in the control plots? At the end of section 2.4, I suggest discussing the benefits and limitations of using counts of culturable microorganisms. This is important for interpreting the results. Section 2.5 needs citations for each method. Section 2.6 should state that all analyses were done on data within site (not between sites). If this is not the case, this needs to be stated and the experimental design clarified (i.e., some fertilization treatments differ between sites). There is no discussion of the stepwise regression results. It is not stated what factors were included in this analysis. What are "polluted sites"? This is the only mention of polluted sites in the manuscript.

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3. Improved topic sentences for the results paragraphs will greatly advance this section. Reflecting on the data in the context of the hypotheses would be helpful. Section 3.1 line 9 the meaning of the following is unclear: "...though more significant difference for N contents between these treatments."

4. The discussion does not adequately address the relationship between the specific fertilization regimes and C cycling. For example, there are type errors and the writing is vague on Line 11: "Here the rice soils under treatments were much richer in total N and the C;N ratios seemed not significant difference between the treatments, the increased microbial biomass and fungi dominance could not be accounted for by C:N variations."

5. I recommend a concluding paragraph, identifying the major contributions of this work.

For all Tables and Figures the treatment names should be consistent with what is used in the manuscript. Fig 4. Are these data from each fertilization plot minus the control plot? Are these data from all sites? Fig. 5 Are these data from all plots, including the control?

Interactive comment on Biogeosciences Discuss., 8, 1529, 2011.