

## ***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.***

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Responses are in red. Responses to the anonymous review 1# General comments: Thank you for the positive evaluation of the finding and the topic of the manuscript. We accept that the language editing needs much improving. Also, we accept that the relationship between the SOC accumulation and soil microbial functioning needs clarified and profoundly discussed in the discussion, which is done in the revised ver-

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sion. Responses to the specific comments 1, Thanks for the positive comment for the hypothesis. The sentence is revised as " Using measuring soil respiration measured in situ, analyzing culturable microbial community structure by a plate incubation technique and SOC contents of topsoil samples collected after rice harvest from long-term experiments across southern China, this study is to : 1) depict the changes in microbial population numbers and fungal predominance; 2) infer a biological stabilizing mechanism behind the C sequestration which includes physical-chemical stabilization as the major controlling process." 2, The reviewer raised the question of SOC accumulation and C cycling under long term fertilization. The relation ship between microbial biomass and SOC content is, of course, an important issue in C cycling and long term fertilization, which had been well addressed in our previous studies of Zheng et al., 2006, Zheng et al., 2007 as well as of Pan et al., 2009b ). In these studies, increases in SOC and microbial biomass carbon were described and increases in total CO<sub>2</sub> respiration and overall CO<sub>2</sub> evolution also observed. However, intensity of CO<sub>2</sub> from respiration in unit of SOC accumulation was not consistent between the fertilization treatments. While SOC accumulation in rice paddies in single site or across these sites were observed under combined fertilization of organic and inorganic fertilizations were well documented, and the mechanisms with physical protection, chemical binding and chemical recalcitrance, this paper reports a further study of the mechanism of SOC accumulation in rice paddies under combined fertilization by integrating the data of SOC and microbial community structure and soil respiratory activity from these sites. It was claimed that this work was to test the hypothesis if microbial stabilization mechanism had any important role in the process of SOC accumulation under well designed fertilization schemes. In the text, we had made some changes in introducing the relevant studies and findings while we focused the microbial stabilization. Some more citations added. The effect of the application of organic amendments on the biological properties of soil has thus become a very interesting subject of investigation, not only due to their importance in soil functioning and structure, but also because changes in biological activity may be used as indicators of soil pollution (Tyler, 1982; Fließbach et

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al., 1994), and many sorts of organic residues. We had addressed these issues and added some relevant studies for strengthen the scientific value. 3, Another question raised by the review is about a threshold for the specific respiratory activity. While there was not enough knowledge on any potential SOC thresholds with regard to microbial activity or soil quality, increase in organic matter may provide only enhanced source of nutrients for micro biota, but also may increase size, biodiversity and activity of the microbial population in soil, thus influencing soil structure, nutrient turnover, and many other related physical, chemical and biological parameters associated with micro-organisms in soil ecosystem (Albiach et al., 2000). In this paper, the authors were not tentatively addressing the issue of a threshold of SOC for microbial activity, however, there may involved any changes in community structure and biodiversity (as shown in our previous works, cited in the reference). And the changes in soil respiratory activity under a SCO level over 20g/kg, may suggest significant changes in biodiversity and community structure in the experiment soils, and this is indeed the issue we were addressing by this work.. This is discussed with relevant findings from literature. 4, Comments on the finding that both inorganic fertilization and organic + inorganic fertilization resulted in decreased specific respiratory activity. This paper was one of a series of our studies on SOC accumulation mechanisms of rice paddies of China, using meta analysis of results from single site across South China. There had been a good number of reports on the effect of specific fertilization treatments on SOC and soil CO<sub>2</sub> evolution of any of these sites. We added some data from previous studies for more clear description of the effects in the text. 5 Specific comments or suggestions for better data expression or corrections (1) More detailed description of "CK " treatment. CK treatment is the treatment receiving no fertilizers. However, all the agro-managements were the same cross the treatment plots. These were well introduced in the revise text. Treatment names made consistent as with in the manuscript as in the figures. (2) More clear description of methods used in sections 2.4 to 2.6. We had done much effort in polishing these sections with enough information of the experiment and analysis methodologies. (3) Some recommendation for improving the

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statements in result and discussion section. We accepted and done in our best. A concluding paragraph added.

Thanks again!

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