

**Associate Editor Decision: Publish subject to technical corrections** (19 Nov 2016) by

Dr. Zhongjun Jia

Comments to the Author:

Dear Prof. Pan

Thank you for submitting the revised ms to BG.

The major criticisms have been addressed, and I would like to have your attention for the following minor concern

Many thanks again!

(1) L23. Please check the abbreviation OC throughout the manuscript, and revise it where appropriate. For example, what does OC really mean, total organic carbon, soil organic carbon, and what is the difference between soil organic carbon and total organic carbon, between total OC and soil organic carbon. In addition, please use the term as specific as possible, and make sure all terms are used consistently THROUGHOUT the manuscript. For example, the terms such as soil organic carbon, total organic carbon, total OC, labile OC and OC are confusing. One could not understand whether OC refers to total organic carbon or soil organic carbon. More specifically, if LOC and TOC are used, the readers may get confused about the OC and soil organic carbon.

Considered. Your criticism followed. We now use SOC instead of TOC for the measurement of soil organic carbon, but organic carbon, avoiding use of OC abbreviation, in the text when not specifically referred to the measurement. This is followed throughout the text.

(2) L35. please rephrase the term of coarse sand, or please use it consistently throughout the manuscript. For example, in L34. It is sand (2000-200  $\mu\text{m}$ ), the general reader will get a bit confused what is the difference between coarse sand and sand. It is also hard for general reader to understand that the coarse sand and sand actually is opposite to fine sand.

Accepted. Use of coarse sand for the fraction in size of 2000-200  $\mu\text{m}$  but sand for that in 200-20  $\mu\text{m}$ . Checked throughout the text. Sorry for the errors in the previous version. The sand fractions mentioned in the last part of discussion is now given as the aggregates in size larger than 20 $\mu\text{m}$ .

(3) L27-32. It can be rephrased as following: Soil aggregates were fractioned into different sizes of clay (<2 $\mu\text{m}$ ), silt (2-20  $\mu\text{m}$ ), fine sand (20-200  $\mu\text{m}$ ) and coarse sand (200-2000  $\mu\text{m}$ ). Soil properties were determined to investigate niche specialization of different soil particle fractions in response to long-term rice cultivation, including recalcitrant and labile organic carbon (ROC and LOC), microbial diversity of bacterial, archaeal and fungal communities, soil respiration and enzyme activity.

Followed.

(4) L33-35. It can be rephrased as follow: The results showed that the mass proportion of both sand and clay fraction increased with prolonged rice cultivation, whereas the aggregate size fractions were dominated by fine sand and silt fractions. Total organic carbon was enriched to the greatest extent in coarse sand fractions, but depleted in silt fractions. Similar trend was observed for ROC content, and the ratio of LOC to TOC showed a slightly decreasing trend with decreasing size of aggregate fractions.

Generally followed with minor modifications.

(5) L41. Replace gene abundance with 16S rRNA gene abundance?

Followed.

(6) L42. Both coarse sand and clay. Please use the term sand or coarse sand consistently

Checked. Here "both coarse sand and clay" is correct.

(7) L42, rephrase it as follows: despite of the largely similarly diversity between the fractions.

Followed.

(8) L43. Can be rephrased as follows: The 18S rRNA gene abundance of fungi decreased sharply with decreasing size of the aggregate fractions, whereas slight change of fungal diversity was observed.

Use of "18S rRNA" accepted.

(9) L48. Delete the phrase of "scaled by total DNA concentration". It can be explained in the materials and methods, and it is also reasonable that soil total DNA is considered as microbial biomass.

Accepted.

(10) L50-53. It can be rephrased as follows: For all particles other than clay fraction, enzyme activity was increased with prolonged rice cultivation, whereas soil respiration appeared to have a decreasing trend.

Accepted.

(11) L53. Delete normalized. The normalization can be explained in the text, or it is a bit abrupt.

Accepted.

(12) L58. It can be rephrased as follows. These results provide a mechanistic understanding of soil organic carbon turnover and microbial community succession at fine scale of soil aggregates that have evolved along with anthropogenic activity of rice cultivation in the field.

Followed.

Supplemental Table S1 and S2 and S3 (please check Table 2 to 6 in the text too)

(1) Please add a horizontal line under P700. Thus the effect of soil size fraction can be clearly separated and visualized.

Followed.

(2) Please add a note at the end of the Table showing the actual size for each fraction. For example: These soil fractions have different sizes with 200–2000  $\mu\text{m}$  (coarse sand), 200–20  $\mu\text{m}$  (fine sand), 20–2  $\mu\text{m}$  (silt) and <2  $\mu\text{m}$  (clay). Or the size can be placed under the term in bracket, and rephrased as silt (20–2  $\mu\text{m}$ ) in the first column. NOTE: this concern also applies to Table 2 (the name of coarse sand, fine sand and silt need to be specified. The full name of MWD needs to be provided); Table 3

Followed. Supplement Table S3 now replaced by a table providing data both of microbial quotient and metabolic quotient, of the aggregate size fractions of the chronosequence.

Yours Sincerely

Many thanks!

Zhongjun Jia