

Dear Editor,

We appreciated the comments by the reviewers and yourself which certainly helped us to improve the manuscript. As following these suggestions, we have revised the manuscript carefully. Our responses to the reviewers' comments one by one are attached directly to the following text. Please don't hesitate to contact us if any open questions do remain. Thanks a lot!

Best regards,

Sincerely yours,

Chunyan Liu and coauthors

Anonymous Referee #3

Specific comments

P 8926 R 19. Be consistent with # of decimal places, two are good.

Yes, we have revised it (See Line 45).

P 8927 R 4-6. The starting sentence structure is awkward. Try to make it clear.

Yes, we have reworded this sentence to make it clear (See Lines 59-61).

P 8931 R 2-4. Interestingly, the soil is sandy loam which has a very low water holding capacity. It would be useful to explain how the crop plants get furrow water that may preferably percolate in sandy loam soil instead of lateral seepage? Also how deep is the soil profile? Is it heavier in the lower depths?

Thanks! As a result of long-term conventional tillage practices, soils in the field site have developed a compact plough pan layer at approximately 20 cm depth, which may substantially inhibit water infiltration and favor lateral flow. We have added this information in the revised manuscript (See Lines 161-163).

P 8932 R 16-17. It is unclear if there was a transplanting hole in the sheet within the frame, as well? I assume there was one.

Yes, there were some transplanting holes in the plastic film inside the frame. We have added this description in terms of this suggestion (See Lines 203-205).

P 8932 R 17-18. Sentence "the top edge of the frames.....of the top chamber" could be clearly explained.

Yes, we have reworded this sentence to make it clear (See Lines 205-206).

P 8932 R 11. Covering the soil essentially alters the spontaneous CO₂ flux by affecting the concentration gradients between soil and the air within the chamber. How was this corrected when the chamber was used for longer time intervals of up to 40 minutes? Also need to be mentioned what regression was used. Also need to explain how the type of regression used (linear or exponential) will explain constantly changing controls on CO₂, CH₄ and N₂O fluxes?

It is true that chamber techniques for gas flux measurement are related to the potential shortcomings, such as temperature and pressure perturbations. These

can have a marked effect on biological activity, and also cause gas expansion or contraction which can complicate flux calculations. In order to reduce the perturbations as large extent as possible, the vented insulated chambers were used in this study, and at the same time the flux calculations were corrected by the measured temperature in the chamber enclosures. In addition, we calculated the gas fluxes in terms of the actual linear or nonlinear changes in the gas concentrations in the enclosed chamber over time (Hutchinson and Livingston, 1993). We have added these descriptions in terms of the suggestion (See Lines 214-217 and 231-233).

P 8933 R 19-20. Were the fluxes corrected for chamber (gas) volume as well?

Yes, the fluxes were also corrected by the chamber volume dividing by the chamber surface area, i.e., the height of chamber in this study. We have added this information according to this suggestion (See Lines 233-234)

P 8936 R 10. Were separate ANOVAs performed for the response variables? Again, also mention the type of regressions analyses?

We did not perform the statistical analysis between gas fluxes and each response variable, and stepwise multiple linear regression analyses were carried out for the relationships between GHG fluxes and environmental variables (See Lines 302-304).

Discussion section. It would be helpful to present and discuss the typical diurnal pattern of air temperature observed in the growing season and fallow. This will complement the fig. 4.

Thanks a lot for this suggestion. It is generally recognized that there exists the temperature-dependent diurnal variation in C- and N-trace gas flux in the rice-based cropping system (Yao et al., 2009). For our present study, we did not investigate the diurnal changes of gas flux due to the low time resolution of manual sampling chamber measurements.

Fig. 4. The fig explains the temperature-flux relationship very well. However, font size of the axis labels is too small to be legible after potential reduction in fig size that usually occurs when the fig is reduced to fit a single column.

Thanks! We have enlarged the font size of axis labels according to this suggestion. (See Fig. 4).

Anonymous Referee #4

General comments:

If possible, mention the amount of water saved (that is, the difference of water consumption between the GCRPS and conventional paddy system). Since the values of complete GHGs exchange and crop production are quantitatively estimated in the manuscript, the information on water exchange is needed to state the biogeochemical cycle within the GCRPS more accurately.

Thanks a lot for the suggestion. But we are sorry for that as our water-monitoring devices could not work well during the measurement period, we did not exactly calculate the difference in water consumption between the GCRPS and conventional paddy system in this study. We will improve the

investigation on this aspect in our further field work.

Specific comments:

P. 8930, L. 2 - 8 and P. 8944, L. 4 - 7: Even for each specific gas (CO₂, CH₄ or N₂O) and/or limited period (e.g., only a growing-season), is there no study of the GHG flux at rice fields using the GCRPS? (I agree that the comprehensive GHGs flux and annually based study are not available). If there are one or more articles, please cite them in the introduction and compare the results in the discussion.

To our knowledge, a few studies have conducted short-term (only in rice-growing season) measurements of CH₄ and N₂O fluxes under GCRPS (Dittert et al., 2002; Xu et al., 2004; Kreye et al., 2007). We have added this information both in the Introduction and Discussion sections in terms of the suggestions (See Lines 136-139, 487-489 and 544-546).

P. 8936, L. 25-26: Mention the number of days for the midseason aeration and final drainage.

Yes, we have added the information about the midseason and final drainage (See Lines 180-182),

P. 8937, L. 3-5 and Figure 1(d): During the midseason aeration (around June 30), why did the soil Eh in the GCRPS also increase? I recognize that the midseason aeration was applied only for the conventional paddy (c.f., P. 8931, L. 23 - 26).

Sorry for our undistinguished description for the water management in the GCRPS and conventional paddy. As following this suggestion, we have added the description about the water management applied for GCRPS and conventional paddy (See Lines 188-191).

P. 8942, L. 14 - 18 (and Figure 1(d)): So far as I know, midseason drainage lasting 7-10 days is a common length and practice in east Asia. Is the duration of midseason drainage in this study similar to those days, or the cited articles? Because the seasonal pattern of CH₄ emission is different from the common pattern, this information would be of some help in understanding.

Thanks! It is true that for the conventional paddy of East Asia, midseason drainage lasting 7-10 days is a common practice. Similarly, midseason drainage in our study was practiced during the period from 25 June to 30 June (i.e., approximately 6 days). We have added this information in the revised manuscript (See Lines 180-181).

Technical corrections:

P. 8927, L. 23: Should "FAO, 2011" be listed in the References?

Yes, we have added the information about "FAO, 2011" in the References (See Lines 693-694).

P. 8933, L. 13: Is it better to change "6 h" to "6 hours"?

Thanks! Revised (See Line 228).

P. 8941, L. 19: Does "The chick ..." mean "The chicken ..."?

Thanks! Revised (See Line 429).