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Interactive comment on "Impacts of rice varieties and management on yield-scaled greenhouse gas emissions from rice fields in China: a meta-analysis" *by* H. Zheng et al.

H. Zheng et al.

jtang@mbl.edu

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Comments to Referee #2 This manuscript provides a useful meta-analysis of area-based and yield-based GHG emission for two different rice varieties. The authors also investigated whether the GHG emission differed among different growth duration after transplanting, and how N fertilization affected GHG emission. Because the demand for rice will continue to increase, it is critical for agricultural lands to be managed effectively, not only to improve the yield, but also to reduce its environmental impacts. This study explored an important perspective that appropriate selection of rice varieties will mitigate GHG emission from rice paddy. My major comments are listed below: Referee

2 comment: As a review paper, the manuscript should provide a comprehensive perspective of this topic. However, the writing of the manuscript is quite rough in places. For example, numerous literates suggested that factors, such as root biomass, root turnover rate, microbial community composition and nitrogen, are critical to regulate CH4 emission. In the introduction section, the authors did not address any of those factors, but concluded that aerechyma is the most important factor controlling CH4 emission of rice paddy, and such conclusion was based on findings from only one study (Wang et al 1995). In the discussion section, the authors made a similar conclusion that the difference in GHG emission between the two rice varieties was due to the difference in their gas transport capacity (Page 19055, line 19-22). Although the authors discussed why aerenchyma systems affected GHG emission, their literature review is far too general. A more specific discussion on aerenchyma systems of the two rice varieties is needed.

Response: We improved the language and organization in the revised manuscript. The published literature on aerenchyma systems between japonica rice variety and indica rice variety is scarce, but we added more specific discussion on aerenchyma systems of the two rice varieties as the mechanism to explain the difference in GHG emissions between the two kinds of varieties.

Referee 2 comment: The data presentation/interpretation also needs to be improved. Many conclusions were made without statistical support, or contradict with their statistical results. For example, in section 3.2, the authors made comparisons of CH4 and N2O emission between different GDAT, but did not provide statistical support for their conclusion. In section 3.3, the authors concluded that the largest reduction of yield-based GWP occurred at the N application rate of 150–200 kgN/ha. However, yield-based GWP were not different among different N addition levels. Their 95% CI of yield-based GWP overlapped with each other. Almost all rice paddies need to receive N fertilizer. Under the same N fertilization rates, do the two rice varieties differ in their yield-based GHG emission? Further analysis addressing this issue will be helpful.

Response: We double checked the data and added statistical results when necessary. About rice variety with the same N fertilization rates, Fu et al (2012) reported that the GWP and GWP per unit yield of the rice type of indica were as the order of traditional rice > the super hybrid rice > the hybrid rice. However, the publication is lacking about GHG emissions at the same N fertilization rates between the japonica rice variety and indica rice variety. So, we have to conduct across-site studies taking N fertilization as a random variable when we compared rice varieties across sites.

Specific comments: Referee 2 comment: Page 19047 Line 14: This statement is misleading. Most CH4 and N2O are emitted via microbial activities. Rice plants may stimulate microbial CH4 and N2O emission by increasing carbon supply to microbes or altering soil conditions; Page 19049 line 26: A brief descriptions about two rice varieties will be helpful; Page 19053 Line 9: Area-based CH4 emission of the two rice varieties were not significant different (P>0.05); Page 19503 line 18: You cannot make this conclusion without a statistical test. A multiple comparison test is needed; Page 19054: Section 3.3: The overall response ratio across all N addition should be assessed. The sample sizes for several N addition levels are too small, which limited the power of the statistical analysis; Page 19054 line 12: N has small impacts on the area-based GWP. The RRs of all N addition level, except for 100-150 kg/ha N, overlapped with 1.

Response: Page 19047 Line 14: We made it clear: CH4 and N2O are emitted via microbial activities in the soil, but some portion of CH4 and N2O are emitted to the atmosphere via rice stems instead of directly from soils. Page 19049 line 26: We have added a description about the two rice varieties: japonica and indica rice varieties, subspecies in Asian cultivated rice, differ in various morphophysiological traits. Page 19053 Line 9: We made revision according to the suggestion. Page 19053 line 18: We made revision according to the suggestion. Page 19054: Section 3.3: We made revision according to the suggestion. Page 19054 line 12: We agree. We made it clear in the revised version.
