

Interactive comment on “Seasonal trends and environmental controls of methane emissions in a rice paddy field in Northern Italy” by A. Meijide et al.

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Received and published: 8 October 2011

This manuscript by Meijide et al. provided comparison of chamber and eddy covariance-based CH₄ emissions in a rice paddy field in Northern Italy. Using eddy covariance techniques can increase our understanding of the diurnal and seasonal patterns of CH₄ emissions and identify the environmental drivers and quantify the CH₄ emissions from a rice paddy field in northern Italy. Comparison of chamber and eddy covariance-based CH₄ emissions can further increase our understanding of the widely existing chamber measurement data and the large spatio-temporal variability of CH₄ fluxes.

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However, I have major questions as following (specific comments):

1. My major concern is about the overestimation with the chamber procedure followed in this study (Section 2.2 and page 9017 lines 18–22): First, sampling time around 12 pm is not representative of the daily average for CH₄ flux. Second, the Plexiglass chamber is not isolated for sunshine and heat thus the temperature inside the chamber would increase obviously during gas sampling. The chamber closure duration lasts for 60 to 90 minutes which is long enough for the rapid temperature increase.

2. Two major measurement gaps for eddy covariance methods (Fig. 3, Page 9011 lines 16–20) (each lasted 2 weeks when the chamber-derived CH₄ fluxes are not small) prevented robust calculation for the seasonal CH₄ emissions. Therefore, comparison between the two methods is not sound.

3. Similarly, the water table management strategies are not applicable in this study since there are not enough measurements when the water table is around 0–10 cm due to instrument interruption (Figures 2 and 3).

4. Environmental factors such as water table are associated with seasonal trends and rice plant development in this study. Thus, separate effects of environmental factors and conclusion of environmental drivers can not be obtained.

Minors (Technical corrections):

1. CH₄ fluxes are composed of CH₄ production, oxidation, transportation, and finally emitted out as flux. Both methods used in this study can only detect the flux, not distinguish the underlying processes. CH₄ production process can not be studied following this procedure. Authors should carefully differentiate using words “emission” and “production”, such as Page 9000 line 10, Page 9001 line 29, Page 9015 line 28, and Page 9020 line 7.

2. Soil water content was at about 60% when water logged in this study (Page 9009 line 24). How can the soil humidity in Figure 2 increased when soil was dried around day

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3. Mismatch between text and figure results; Page 9010 line 9-10 and Figure 3. Rewrite as “The highest half-hourly emissions were measured in July and August, in the reproductive (not vegetative) and ripening periods”.

4. There is no need for inclusion and discussion of the seasonal integrals of CH₄ fluxes measured with chambers without correction for chamber temperature. Figure 6 and page 9012 line 20-24.

5. Check the language grammar and expression for concision throughout the whole manuscript.

For example,

Page 9000 Line 14 rewrite as “Methane fluxes were measured during the rice growing season with both EC and manually operated closed chambers”

Page 9000 Line 19 missing word for “The EC measured . . . showed”

Page 9000 Line 22 rewrite as “The comparison between two measurement techniques”

Page 9001 Line 21-25 rewrite as “Field experiments have shown that there is a large spatio-temporal variability on CH₄ emissions from rice fields. . . , which limits the possibility to produce robust estimates of yearly surface budgets.”

Page 9011 Line 7 rewrite as bi-week (not be-week).

Page 9012 Line 7 rewrite as difference between the two methods (not between both of them).

Page 9014 Line 23 delete “and”.

Interactive comment on Biogeosciences Discuss., 8, 8999, 2011.

BGD

8, C3507–C3509, 2011

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