Biogeosciences Discuss., 7, C2799–C2806, 2010
www.biogeosciences-discuss.net/7/C2799/2010/

Biogeosciences
Discussions

Interactive comment on "Nitrous oxide emission from highland winter wheat field after long-term fertilization" *by* X. R. Wei et al.

X. R. Wei et al.

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Received and published: 8 September 2010

Response to Referee 2:

Dear Referee 2:

Thank you very much for your valuable comments and suggestion. Our responses are as follows:

1. Manure fertilizers have a long history of use in the area, chemical fertilizers began to be used in the 1960s, and chemical fertilizer and manure were often used together. We will add the following text to the revised MS in order to address this issue:

Manure fertilizer has been extensively applied to farmland in China for more than 2000

years. In the past 50 years, with the use of chemical fertilizers, manure and chemical fertilizers were often used together to increase crop yields (Shen, 1998). For example, in the central the Loess Plateau, the average manure application rate before 1960 was 22.9 ton/ha. Chemical fertilizers were not used before 1960. Yet after 1960 the manure application rate was 24.9ton/ha and the chemical fertilizer rate was 178 kg/ha (Hao et al., 1991). Therefore, even after chemical fertilizer applications became popular, manure still accounted for an important part of the total N applied to farmland soils in the area. Thus, the effects of manure on N2O emissions should be investigated.

2. We measured Nmin (nitrate and ammonium) and Ncrop when the wheat was harvested, but we did not measure them when N2O fluxes were measured. We did not find close relationships between Nmin, Ncrop, and N2O emissions. This might be due to the seasonal variability in N2O emissions, Nmin, and Ncrop. We decided not to include additional Nmin and Ncrop information in the revised MS. However, here in our response we include the Nmin, Ncrop, and N2O emission data in Fig 2-1, Fig 2-2, and Fig 2-3, respectively.

3. Regarding the discussion on soil organic C effects on N2O emissions, we agree that it is the quantity of readily available soil organic C that plays an important role in denitrification, and thus, N2O emissions (Burford & Bremner, 1975; Christensen & Christensen, 1991). In an earlier study, we showed that soil organic C was significantly correlated with high, medium and low labile soil organic C in crop land and grass land with and without fertilization (Please see Fig 2-4, the results have been published in Environmental Science (Wei et al., 2008)). Such relationships were also reported by other authors (Burford & Bremner, 1975; Christensen & Christensen, 1991). Therefore, from this aspect, we think that our interpretation of soil organic C (and thus C/N) and N2O emissions is reasonable. However, as you have indicated, there are other factors that should be considered.. In the revised manuscript we will add the following text that indicates additional factors that may affect the relationship between organic C and N2O emissions.

The application of manure fertilizer often improves soil structure (Bronick and Lal, 2005), increases soil porosity, and decreases WFPS, which reduces the denitrification rate and thus decreases N2O emissions. Liu et al. (2000) and Huo et al. (2008) reported that manure fertilizer has a large potential to increase soil porosity and aggregation in the Loess Plateau, which improves soil aeration. In our study, the WFPS in CK, N and NP were 3 to 20% higher than in M and NPM, which partly explains the manure effects on N2O emissions.

In the revised manuscript we will also add information to the Introduction section from the Dittert groups' publications in Soil Biology and Biochemistry in 2005 and 2006.

Thanks again for your comments, we welcome your further comments and suggestions.

Best wishes,

Xiaorong Wei

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Interactive comment on Biogeosciences Discuss., 7, 4539, 2010.

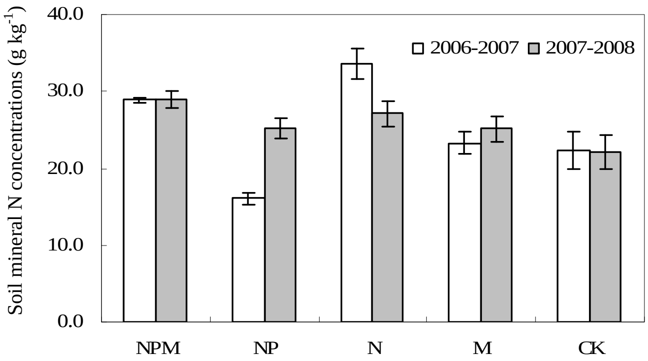

Fig 2-1 The effects of different fertilization on soil mineral N.

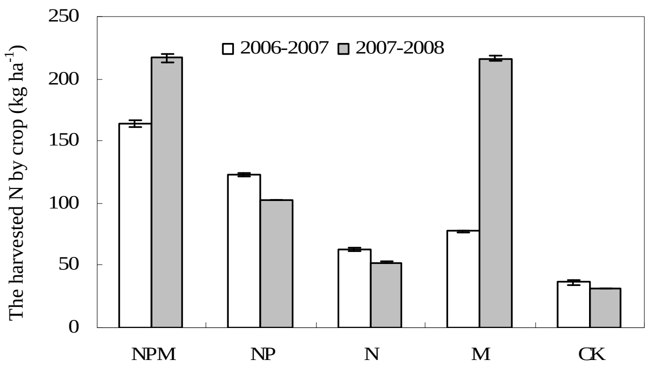

Fig 2-2 The effects of different fertilization on crop N.

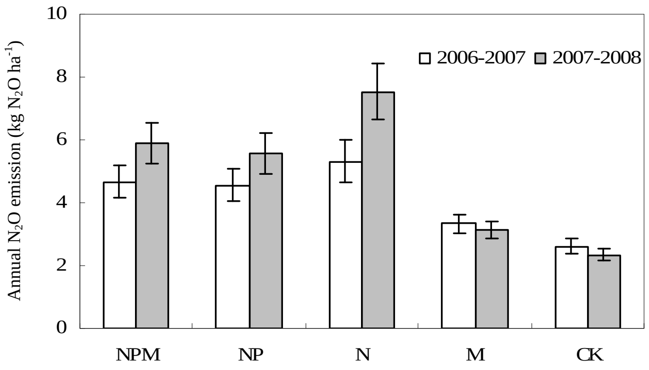

Fig 2-3 The effects of different fertilization on annual N_2O emission.

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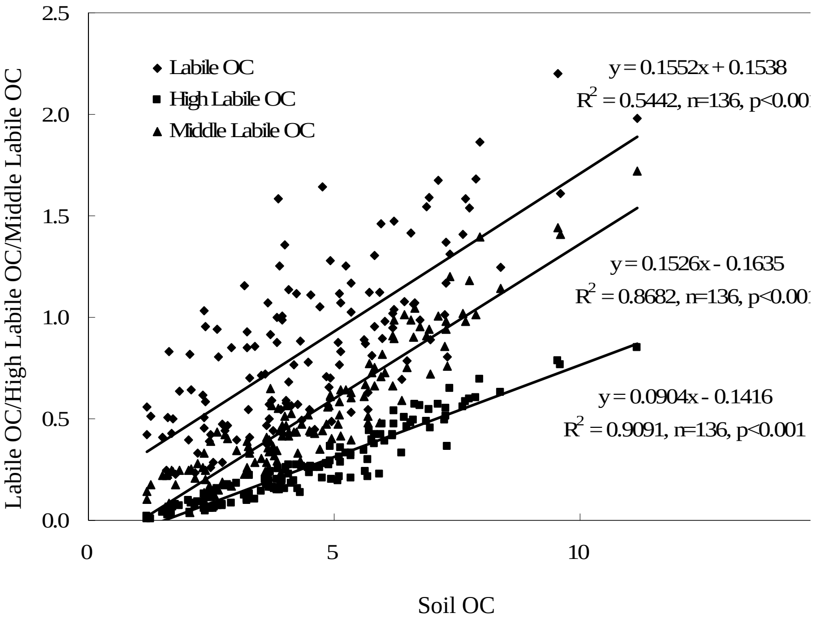

Fig 2-2 The relationships between soil organic carbon and labile organic carbon in t

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