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Interactive comment on “New estimates of direct N₂O emissions from Chinese croplands from 1980 to 2007 using localized emission factors” by B. Gao et al.

Anonymous Referee #1

Received and published: 22 August 2011

Nitrous oxide (N₂O) is currently estimated to contribute 7% of observed global warming. And the application of nitrogen fertilizer contributes large proportion of the N₂O emission from agriculture in the world. Therefore, estimating the direct N₂O emission from a region or a country is important for taking measures to mitigate this greenhouse gas. As the largest producer and consumer of N fertilizer in the world, the total emission of N₂O from China's agriculture is an interesting topic. Compared to other similar studies, this study had differentiated the N₂O emission from paddy fields and uplands, and also used the new N₂O emission factor (EFs) based on the current data available in China. It gave us a big picture about N₂O emission from Chinese croplands. Therefore, it is a very informative paper.

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The N₂O emission from the N fertilizers and manures added into soil is determined by many factors, including soil, climate, cropping system, and management practices. It is highly temporally and spatially variable; and so does the N₂O emission factor, the key parameter used to estimate the total N₂O emission from an ecosystem or regions/country. The emission factors used by authors were obtained by the method of cube root transformation of the original data from different locations of China. It was 0.41% for paddy fields, and 1.05% for uplands. These emission factors were higher than the default values of IPCC guidelines (2006) (0.3% and 1.0% for paddy fields and uplands, respectively). Several points I must address are (1) Recent studies in other countries indicate that these emission factors may be too high for estimating N₂O emission. For example, Dusenbury et al (2008) found that the mean N₂O emission factor was only equivalent to 0.26% of applied N fertilizer from Northern Great Plains in USA. In semi-arid climate of western Australia, it is as low as 0.02% in a rain-fed wheat ecosystem, 60 times lower than the IPCC default value (Barton et al., 2008). (2) The emission factor was also affected by the application rate of N fertilizer; and it rose nonlinearly with fertilizer application rate. Applications in excess of uptake capacity had larger N₂O emission factors (Grant et al, 2006). Because China is a huge country, the application rate of N fertilizer and manures is highly spatial and temporal variation (Ti et al., 2011). If the authors could use the different emission factors for the different regions, it would give more reliable results, and improve the quality of the paper. (3) In relative to the size of China, the observation sites are not enough. Furthermore, the N₂O emission data was mainly concentrated in the east of China, and less observation sites in vast central and west regions. It also increases the uncertainties of direct N₂O estimation.

I suggest the authors could give more details of climate, soils and cropping systems of the N₂O emission data. It is very helpful for readers to make their judgement. The information presented now is too simple. The contribution of N₂O from synthetic N fertilizers declined by 7.5% from 74.9% in 1980 to 69.6% in 2007 in paddy fields; on the contrary, it increased by 58.9% from 49.5 in 1980 to 78.9% in 2007 in uplands. I

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suggest the authors could analyse the reasons in discussion section.

I could not find the paper by Ju et al (2011) mentioned in line 28, page 6974 in references section. The “organic soil” in line 15, page 6977, seems confusion to me. It is the soil added with manure? Or soil rich in organic matter?

References:

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Interactive comment on *Biogeosciences Discuss.*, 8, 6971, 2011.

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