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Interactive comment on "Isotopically enriched ammonium shows high nitrogen turnover in the pile top zone of dairy manure compost" *by* K. Maeda et al.

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Referee #2 Manure compost is a major source of nitrogenous gases like ammonia (NH3) and nitrous oxide (N2O) in the atmosphere, and plays a role on global nitrogen cycle. Especially, N2O is a highly-efficient greenhouse, and also destroys ozone in the stratosphere. Therefore researches concerning manure compost, especially the emission of nitrogenous gases during manure compost, have important significance. This work is initiated from the phenomenon that the emission of N2O mitigated when bulking agent was adopted during manure compost, which was found in the authors' previous study. From the Introduction section, the investigation on the mechanism

of N2O mitigation in dairy manure compost piles with bulking agent through isotope analysis should be the major subject of this paper. However, in the Results and Discussion sections, the authors just focus on the enrichment _15N-NH4+ at the top of dairy manure compost piles, and attribute this enrichment to high nitrogen conversion, nitrification-denitrification activity and NH3 volatilization. The mechanism of N2O mitigation with bulking agent is not interrupted. It is needed a revision to make the subject clear before publication. Besides, some expressions in this paper are unclear and inconsistent, which make it difficult to understand this paper.

Thank you very much for this helpful comment. What we found in previous study was that N2O emission can be mitigated by the use of bulking agent. Therefore we tried to understand why this occurs. This was our motivation, so we need to state this. Two of the three compost runs used piles exactly the same as in the previous study. We confirmed that N2O emission was mitigated in these two runs. However these data were already published, so we did not provide the N2O emission data in this study. We stated that the same compost piles were used in the text, and added some discussion on the N2O emission.

Specific comments: 1. The authors use "pile with bulking agent", "pile with dried grass (pile 1)" to describe the dairy manure compost piles. From their previous paper (Maeda et al., 2013a), dried grass is the bulking agent, however, it is not illustrated in the present paper.

Thank you very much for your comment. We stated this in the Materials and Methods section (P.7580, L.9-13). Lactating Holstein cow excrement and dried grass (Orchard grass; Dactylis glomerata) were used in this study to make the compost. About 4 t of dairy cow excrement and 400 kg of dried grass were mixed to form the treatment piles (pile 1), while the control piles (pile 2) consisted of dairy cow excrement alone.

2. N2O mitigation with bulking agent was found in Maeda et al. (2013a). Is similar phenomenon found in the present studies? Are experiments in the two papers the

same ones?

Thank you very much for this point. In both studies (this work and the previous one; Maeda et al., (2013a)), we used the data from three independent manure compost piles. Two of them were identical to each other.

The manure compost piles used in the previous study (Maeda et al., (2013a)) were as follows. Run 1: July 21 through September 17 in 2009 Run 2: May 27 through July 21 in 2010 Run 3: September 15 through November 10 in 2010

The manure compost piles in this study were as follows. Run 1: 27 May through 21 July in 2010 Run 2: 15 September through 10 November in 2010 Run 3: 19 May through 14 July in 2011

Runs 2 and 3 in the previous work were identical to Runs 1 and 2 in this study. But we did not mention 15N of ammonium in the previous study. A mitigation effect on N2O emission was observed on at least two of three piles (we did not measure N2O emission from Run 3). We stated this in the text.

3. Line 16 of Page 7583: "Temporal decrease of _15N value of NH4+ were observed in both piles" →"The decrease of _15N value of NH4+ in the first two weeks were observed in both piles"

Thank you very much. We have changed the expression as you suggest.

4. Line 19-21 of Page 7583: "The _15N value of NH4+ were significantly higher in the piles with bulking agent 17.7-1.3‰ than that of the piles without bulking agent (11.8-0.9‰" → "The _15N value of NH4+ at the end of experiments were significantly higher in the piles with bulking agent (17.7-1.3‰ than that of the piles without bulking agent (11.8-0.9 ‰

Thank you very much. We have changed the expression as you suggest.

5. Line 22-25 of Page 7583: Why more organic matter degradation cause higher _15N

value of NH4+? It seems to be inconsistent with the declaration in Line 17-18 that the ammonification of organic N supplies light NH4+.

Thank you very much for your comment. We fully agree with you that these statements are inconsistent. We changed the relevant sentences to make this more clear.

6. Table 1: The authors annotate "C, control; T, treatment; Values followed by different letters indicate significant difference (P < 0.05)", however, there were no "C", "T" and"letters following values" in the table. The authors should check this table carefully.

Thank you very much for this pointing. We simply deleted the unneeded descriptions from the footnote of Table 1: C, control; T, treatment, Values followed by different letters indicate significant difference (P<0.05).

Interactive comment on Biogeosciences Discuss., 12, 7577, 2015.