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Interactive comment on “Short-term effects of biogas digestate and cattle slurry application on greenhouse gas emissions from high organic carbon grasslands” by T. Eickenscheidt et al.

Anonymous Referee #1

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Short-term effects of biogas digestate and cattle slurry application on greenhouse gas emissions from high organic carbon grasslands
General comments: On the whole, an interesting subject, important research and clearly presented. Digestate consisting of peatland substrate was returned back by applying it to two different peatlands with different soil organic matters and compared with fertilization with cattle slurry. The experimental design consisted of three large plots (three treatments) per peatland, on each large plot three static chambers for greenhouse gas measurements and eight chambers for ammonia were used (ammonia was only measured at one of the five application events). Grass yield was measured and apparent N use efficiency and N-balances were performed. In the statistical analysis, soil type and fertilizer treatment

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were fixed effects and the spatial replication in individual large plots nested in time as random effect. An experiential design with small plots like in complete randomized block design would be preferred with three replicates (blocks) instead of three chambers per large plot, as there are very large spatial field variations in soil conditions resulting in high spatial variation in gas emissions, especially nitrous oxide. However, the experiment was repeated at five times, and thereby replicates were achieved. The N₂O and CH₄ flux were measured for two years, with more intensive sampling after each application, which is fine. A key issue, when relating the N₂O emissions to the applied amounts, is the spreading accuracy (rate and evenness). From the article, it is understood that there were some problems in the start with spreading and there for the spreading was performed with watering cans on small plots at first and forth spreading event. Splash plate spreading devices gives often very uneven spreading (variance of coefficient of more than 30%), and this must be discussed and there are a need of more technical description of the evenness of spreading and how the spreading was performed in order to secure an high evenness. Detailed comments: Line 66: Misspelling Rodhe, missing ; between the two references. Line 120: Instead of “amounts”, do you mean “concentrations”? The amounts depend on application rate and concentrations. Line 135: Take away the space in the word “annual” Line 153-155: Equipment (fabricate, sensor types) for measuring temperature, humidity and moisture? Line 178: No – before 2 in m². Line 202: Take away space in word “detector” Line 253: Add analyzing methodology (standards) Line 357: Take away . after Table Line 859: Missing an inter-space between 384, and 2010 Line 955: Misspelling Germany Figures Figure 1: Shortage of Application “APL” perhaps better “APPL”? Figure 2 caption: Misspelling of “mark” Figure 6: The model function for cattle slurry is missing “x” in the formula. Should it be $-0.0114x$?

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