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Interactive comment on "Significant non-linearity in nitrous oxide chamber data and its effect on calculated annual emissions" *by* P. C. Stolk et al.

Anonymous Referee #2

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The Authors using two years field N2O flux measurements as an example, how N2O fluxes obtained by the closed chamber method may be biased, if they are calculated by fitting a linear regression. The authors present three common calculation methods with the know advantage and disadvantages, but not a novel alternative model for estimating the fluxes that can be help to solve the problem. The authors of the manuscript are evidently familiar with these problems based on the publication Kroon et al. 2008 where the author Hensen is co-author and their literature review presented in the introduction. Nevertheless I missing a preoccupation with non steady-state approaches (e.g. Livingston et al. 2006, SSSAJ). These problems seem to be still partly unsolved in closed chambers despite of advances in measurement technology, but a practicable solution must be finding as soon as possible. Uncertainties in the more specific mod-

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els then the linear approach are the strongest limitation for their use. The fact that the misgiving exist, to overestimate the fluxes (e.g. with the exponential model) is leading to a conservative estimation using the linear model by the most scientists. The paper is well written and the topic and results are relevant for the readers of Biogeosciences.

P 124 L 12 ff: This rough plausibility estimation is very interesting. Other Authors (e.g. Matthias et al. 1978; Pedersen et al. 2001, as cited by the authors) found k values considerably smaller. Therefore a discussion about the reason of this k values is necessary. It must be pointed out (perhaps with an additional figure) which type of measuring curve lead to this problems, otherwise the decision of the authors to rejected the exponential regression model is not to understand (SSE smallest, median for r2 and ra2 largest value). I do not fully agree with the conclusion that leakage must be relevant. Especially for N2O consumption in the soil is an important loss pathway. The close chamber will be caused in a higher concentration of N2O in the soil (see e.g. Matthias et al. 1978) and consequently the reduction to N2 will be increased, at lest for a first order kinetic or a MM-kinetic which is not in the saturation region. Lost from the chamber atmosphere can be easily measured with a tracer (best with 15N2O, but also with SF6 which is measurable with the ECD in one run with N2O), as show by Kroon et al. 2008. P128 L20: Is there an indication in the measurements that the differences between linear and exponential regression methods are higher on dry periods (when cracks are likely)?

Interactive comment on Biogeosciences Discuss., 6, 115, 2009.