Referee 1 Fuss

From the text and figure captions it is not clear to me, if Fig. 3 and Fig. 4 contain more than one data point per site, but that seems to be the case. If so, than the assumption of independence is violated for linear regression and at least the confidence and prediction bands are most likely not calculated correctly…

We are grateful to the referee for highlighting this issue. We can confirm that Figs 3&4 always contain more that one data point per site. This will be clarified in the legends to these figures.

Referee 2 Dalal

…. In general, it is difficult to interpret the nitrous oxide emissions from such as wide range in soils, management and climate, and inherent nature of large variability in nitrous oxide emissions. The authors have summarised the nitrous oxide emissions data satisfactorily. Since nitrous oxide measurements were sporadic and sparse, and nitrous oxide emissions data required log-normal transformation, authors should have done interpolation of the data on the log-transformed nitrous oxide emissions rather than linear interpolation between two measurement events. Authors should add a table listing the stepwise multiple regression output and significant level of the regression coefficients of the drivers associated with nitrous oxide emissions. It is hoped that the dataset will be useful for validation of nitrous oxide models and hence extend the applicability of this study both in space and time.

We are pleased that the referee considers that we have summarised the data correctly using log-transformed data. While we recognise that it is possible to calculate annual fluxes using interpolation of log-transformed data, this approach is not widespread, and indeed each of the individual published site papers from which this manuscript was developed have used a linear interpolation of untransformed data to report annual emissions. This is also consistent with guidelines currently being developed by the Global Research Alliance on Agricultural Greenhouse Gas Emissions. We therefore propose to retain the existing method of calculation.

As suggested by the referee, we will include a table listing the stepwise multiple regression output and significant level of the regression coefficients of the drivers associated with nitrous oxide emissions.

Referee 3 Anonymous

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….General comments The methods in general are not sufficiently explained. Statistical methods are not explained in enough detail and I have concerns that the chosen analysis techniques were not the correct ones (see specific comments). The experimental methods used, like the chamber design (or different ones), and analytical analysis. are not described in enough detail either. No uncertainties or errors associated with these methods are mentioned which makes it rather difficult to interpret the results. The manuscript needs a thorough revision of statistical analyses and a lot more detail about experimental methods and analyses as well as details about the datasets used ought to be included.

Specific comments 9261 l1 Why Zimbabwe? It is not clear to me what the site from Zimbabwe can add to an otherwise European dataset. It would make more sense to either have European sites only or add more sites from other continents. Having just one other site amongst an all European dataset appears to be a bit unrepresentational.

We recognise the need identified by referees 3&4 to improve the description of methods. This has been done by including an additional Table (1b) with the following headings:

Site name	Number of replicate chambers per treatment	Sampling frequency	Flux calculation method (to account for linearity of N_2O accumulation)	Temporal integration method	Analysis method

In addition we have added additional explanation of the methodology in the text and presented a more detailed analysis of the statistical output.

The shortcomings of chamber techniques are recognised by the authors. We do not wish to make this a major area of discussion within the paper since this has been and remains a very active area of discussion in the literature. However we are happy to refer to some of the key references suggested that highlight uncertainties associated with chamber measurements.

We acknowledge that the inclusion of data from Zimbabwe represents a rather surprising approach. The Zimbawean site was funded by the same research project and included in the analysis for that reason. However in response to the comments of referee 3 we have now removed the site from the statistical analysis and presentation of data (Figs 2, 3 &4), but retained some comparisons between the Zimbabwe data and European data towards the end of the results section (Fig 5) and briefly in the discussion. We will provide a brief justification in relation to the NitroEurope project in the text.

Referee 4 Philate

…. However, due to the differences in the N2O flux measurement methods (e.g. chamber designs, number of replicate chambers, frequency of measurements, flux calculation etc.), the comparison of N2O emission rates between different measurement sites remain very uncertain. This aspect should be clearly clarified and the potential errors, or at least uncertainties, in the measurement method should be acknowledged. Because of the high uncertainty related to the methods, the focus should be more on evaluating the effects of different management practices on N2O emissions, and further, to discuss the potential mitigation strategies.

Specific comments
Page 9264, lines 6-12: The description of the N2O flux measurements is inadequate. For instance, how many replicate chambers were used? How many gas samples / chamber closure were taken? What is the "standard methodology" in flux calculation? If it is linear regression, did you apply linearity checks for the N2O concentration development within chamber headspace? All of the above issues can lead to large errors in the flux estimates, making the comparison of N2O emission rates measured with different chambers unreliable, unless the methods are harmonized. For instance, the choice of a wrong flux calculation method (linear vs. non-linear) may lead to severe underestimations (e.g. Kroon et al., 2008; Pedersen et al., 2010; Christiansen et al., 2011), and that the rate of underestimation can be different between the chambers used. However, this does not ruin the comparison of the treatment effects on N2O emissions (e.g. fertilization, tillage, cropping, warming, drought etc.).

As noted above we will revise the manuscript to include a more detailed description of methodologies and analysis of uncertainties associated with them. We are happy to revise the paper in order to place more emphasis on treatment effects than site comparisons (with modifications to Fig 5).

In reflecting the above changes, some modifications will be made to the abstract

Other (more minor) specific comments provided by referees 2-4 will be answered by modifications to the text as suggested.