



Distinguishing peaks from background emissions of nitrous oxide in grassland ecosystem

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Nitrous oxide (N_2O) is a powerful greenhouse gas. Its emissions from soil are known to be highly variable. Up to 85% of total emission occurs in short events of high intensity, associated with nitrogen fertilisers' applications under favourable environmental conditions. These events, however, have not been quantitatively characterised partly due to methodological limitations. The majority of N_2O studies are performed using the closed chamber technique, which has a number of limitations including: frequency and time of measurements, spatial scale and resolution of measurements. Furthermore, closed chambers are not suitable for handling short-term events. The eddy covariance (EC) technique allows for continuous landscape-scale monitoring of trace gas fluxes. Consequently, EC measurements can better capture the temporal variability of N_2O fluxes. There is a need for an objective method of peak identification in order to separate peak event from background fluxes. The aim of this work was to establish a simple quantitative criterion of N_2O flux peak identification in an EC time series. Examination of daily averaged fluxes is a possible approach, but this imposes an artificial constraint that is not characteristic of nitrous oxide fluxes, which vary on sub-daily time-scales. Access to raw 10 Hz records made it possible to calculate fluxes at different averaging intervals (e.g., 20, 30 min, etc.) and as such performance comparison in terms of peak identification was also carried out. In our study varying the averaging intervals did not largely affect overall flux sums (all being within 5% of $2.38 \text{ kg N}_2\text{O-N ha}^{-1}$ for 8.5 months of 2007) but individual peak event magnitudes and durations were affected.