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Continuous measurements of N2O emissions from arable fields

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Agriculture represents 59 % of the anthropogenic nitrous oxide (N2O) emissions, according to the IPCC (Ciais et al. 2013). N2O emissions are typically irregular and vary widely in time and space, which makes it difficult to get a good representation of the emissions (Henault et al. 2012), particularly if measurements have low frequency and/or cover only a short time period. Manual measurements are, for practical reasons, often short-term and low-frequent, or restricted to periods where emissions are expected to be high, e.g. after fertilizing. However, the nature of N2O emissions, being largely unpredictable, calls for continuous or near-continuous measurements over long time periods. So far, rather few long-term, high resolution measurements of N2O emissions from arable fields are reported; among them are Flessa et al. (2002) and Senapati et al. (2016). In this study, we have a two-year data set (2015-2017) with hourly measurements from ten automatic chambers, covering unfertilized controls as well as different nitrogen fertilizer treatments. Grain was produced on the field, and effects of tillage, harvest and other cropping measures were covered.

What we can see from the experiment is that (a) the unfertilized control plots seem to follow the same emission pattern as the fertilized plots, at a level similar to the standard mineral fertilized plots (120 kg N ha-1 yr-1) and (b) freeze/thaw emissions are comparable in size to emissions after fertilizing. These two findings imply that the importance of fertilizing to the overall N2O emissions from arable soils may be smaller than previously expected.

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