Temporal variability of nitrous oxide fluxes from a fertilized grassland in Belgium: preliminary results from dynamic closed chambers.

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This work presents preliminary results of nitrous oxide (N\textsubscript{2}O) fluxes measured by dynamic closed chambers from a fertilized grassland grazed by the Belgian Blue breed of cattle. It is part of a project funded by the public service of Wallonia (SPW-DGARNE), whose objectives are to make a carbon/CO\textsubscript{2} balance of the grassland (Jérome et al., 2013) and to quantify CH\textsubscript{4} (Dumortier et al., 2013) and N\textsubscript{2}O fluxes.

The site is located in Dorinne (Dorinne Terrestrial Observatory), Belgium (50° 18’ 44” N; 4° 58’ 07” E; 248 m al.). It is a permanent grassland of ca. 4.2 ha with a moderate slope of 1 to 2 %. Mineral fertilisation took place in March and May 2012.

Two cylindrical chambers of 19.2 cm diameter and 11.5 cm height were placed inside a protected area around a micrometeorological station. An infrared gas analyser (Thermofischer 46i) was used in order to measure the N\textsubscript{2}O concentrations inside of the chambers, closed by automatically controlled lids and ventilated by a constant air flow of 1 liter/min. These devices were completed by adjacent soil humidity and temperature sensors.

The first measurement campaign took place during June and July 2012. The chambers were installed in the field and N\textsubscript{2}O fluxes were followed without manipulation. N\textsubscript{2}O fluxes were characterised by a background emission (between 2 and 10 ngN.m\textsuperscript{2}s\textsuperscript{-1}) on which intense but time limited peaks (between 50 and 300 ngN.m\textsuperscript{2}s\textsuperscript{-1}) superimposed. Peaks were found to be mainly linked to fertilisation and driven by precipitation. Background fluxes were found to correlate positively with soil temperature.

Secondly, a manipulation experiment took place in November 2012: two different fertilizer treatments were applied to the chambers. Doses of respectively 100 and 200 kg N/ha of ammonium nitrate were sprayed in the chambers (equivalent to a 8 mm precipitation). N\textsubscript{2}O fluxes peaked shortly after fertiliser application (respectively 300 and 550 ngN.m\textsuperscript{2}s\textsuperscript{-1}), as well as after a posterior rain event (respectively 800 and 1500 ngN.m\textsuperscript{2}s\textsuperscript{-1}). The peak dynamics suggests a complex interaction between soil humidity and nitrogen availability, which is under study.


Keywords: grassland, N\textsubscript{2}O, chamber method, fertilizer