Geophysical Research Abstracts
Vol. 18, EGU2016-**PREVIEW**, 2016
EGU General Assembly 2016

Impact of tillage on N2O and CO_2 efflux in an agricultural crop

Margaux Lognoul (1), Nicolas Theodorakopoulos (2), Marie-Pierre Hiel (2), Bernard Heinesch (1), Bernard Bodson (2), and Marc Aubinet (1)

(1) University of Liege - Gembloux Agro-Bio Tech, TERRA, Avenue de la Faculté, 8, B-5030 Gembloux, Belgium, (2) University of Liege - Gembloux Agro-Bio Tech, AgroBioChem Dept., Passage des Déportés, 2, B-5030 Gembloux, Belgium

In an experiment conducted in the Belgian loess belt between June and October 2015, the effect of two tillage treatments (CT - conventional tillage and RT - reduced tillage) on CO_2 and N2O fluxes exchanged by a maize crop were compared. The experimental site included two parcels subjected to crop residues incorporation and to their respective tillage treatment (CT and RT) since 2008. Fluxes were measured using two fully automated sets of dynamic closed chambers, allowing a 4.5h temporal resolution. Soil water content and temperature were also monitored as well as pH, total N (TN) and total organic C (TOC) content.
Results suggest that tillage practices significantly impacted emissions of both gases, with average soil respiration twice as large for RT than CT (91 μg C.m-2.s-1 versus 44.5 μg C.m-2.s-1) and N2O fluxes 8 times greater for RT than CT (5.55 ng N2O_N.m-2.s-1 versus 0.68 ng N2O_N.m-2.s-1). These observations could be explained by an effect of tillage treatment on stratification of crop residues within the soil profile, as shown in our experiment. Indeed significantly higher TN and TOC content were measured in the surface layer (0-10cm) under RT and that might have enhanced microbial activity responsible for CO_2 and N2O production.
A single N2O emission burst was observed in both treatments, most likely triggered by a sudden and important increase of soil moisture with a time delay of 4.5h for RT and 27h for CT. Here again, peak mean emissions were 9 times larger for RT than for CT (13.3 ng N2O_N.m-2.s-1 versus 1.43 ng N2O_N.m-2.s-1 for CT). The absence of peak emissions later during the experiment, despite the occurrence of similar soil moisture increases suggests that such increase is not the sole condition to generate N2O bursts. In the present case, it is possible that the absence of further peaks was due to a non-availability of soil N caused by increased competition for N because of maize growth.
The system of automated chambers proved it suitability in such experiment and the observations confirmed the need for high temporal resolution and continuous measurement in order to detect peak emissions and analyze their dynamics.

Acknowledgements: AgricultureIsLife, AgriGES