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Biochar application reduces N_2O emission in intensively managed temperate grassland

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Biochar, a pyrolysis product of organic residues, is seen as an amendment for agricultural soils to improve soil fertility, sequester CO_2 and reduce N_2O emissions. Mainly used in highly weathered tropical soils, the interest of using biochar in intensively managed temperate soils is increasing. Our previous laboratory incubations have shown N_2O reduction potentials of between 20 and 100% for temperate soils after biochar application (Felber et al., Biogeosciences Discuss, 2012).
To assess the effect of biochar application under field conditions, a plot experiment (3 control vs. 3 biochar amended plots of 3x3 m size at a rate of 15 t ha^{-1}) was set up in a temperate intensively managed grassland soil. N_2O and CO_2 emissions were quasi-continuously measured by static chambers under standard management practice over 8 months. In parallel soil samples were taken monthly from all plots and their N_2O and CO_2 productions were measured under controlled conditions in the lab.
At the beginning of the field measurements (April 2011) cumulative N_2O fluxes from biochar amended plots were above those of control plots, but the pattern reversed towards reduced fluxes from biochar plots after 3 months and the reduction reached about 15% by the end of 2011. The biochar effect on reducing N_2O emissions in the laboratory was two times that of the field measurements, indicating that results from laboratory experiments are not directly transferable to field conditions. The experiments indicate a substantial N_2O emission reduction potential of biochar in temperate grassland fields.