Geophysical Research Abstracts
Vol. 21, EGU2019-18506, 2019
EGU General Assembly 2019

Assessing methane consumption in forest soils for greenhouse gas mitigation and offsetting

Anna Walkiewicz (1), Piotr Bulak (1), Bruce Osborne (2), Mohammad Ibrahim Khalil (2), Syed Faiz-ul Islam (2), Bart Kruijt (3), Ronald Hutjes (3,4), Daniel Spengler (5), Pia Gottschalk (5), Torsten Sachs (5), Katja Klumpp (6), Aurore Vigan (6), Mélynda Hassouna (6), Laurence Shalloo (7), and Donagh Henessy (7)

(1) Institute of Agrophysics, Polish Academy of Sciences, Department of Natural Environment Biogeochemistry, Poland (a.walkiewicz@ipan.lublin.pl), (2) University College Dublin, Ireland, (3) Wageningen University, Netherlands, (4) Wageningen Environmental Research, Netherlands, (5) Helmholtz Center Potsdam - GFZ German Research Centre for Geosciences, Germany, (6) Institut National de la Recherche Agronomique (INRA), France, (7) Teagasc, Ireland

Forest soils have the potential to oxidize CH4 through methanotrophic activity. Forest ecosystems may thus be an important landscape element in mitigating greenhouse gases (GHGs), notably CH4. However, little is known on the ability of forest soils to consume CH4, and on the importance of CH4 sinks at the landscape scale. Within the scope of an FACCE ERA-GAS project (Managing and reporting of greenhouse gas emissions and carbon sequestration in different landscape mosaics; GHG-Manage), field and laboratory experiments were carried out to assess the CH4 uptake capability in soils of diverse European forests ecosystems, including afforestation, under different management interventions. The field experiments comprised of 10 different forest types (deciduous, coniferous, and mixed) with ages ranging from 11 to 90 years and percentage composition of tree species, and soil types in Poland. Gas measurements were done over 6 months at a monthly interval during summer and autumn 2018. The highest CH4 uptake (avg. 1.62 mg C m-2 day-1) occurred in Eutric Gleysol under 75 years old deciduous forest, while the lowest in Dystric Cambisol under the youngest deciduous forest (avg. 0.145 mg C m-2 day-1). In sandy soils, CH4 consumption was higher than in silty soils (about $\geq$ 1 and $\leq$ 0.7 mg C m-2 day-1, respectively), however it was seasonally variable - higher in summer than in autumn. Our results confirmed that all tested forest soils were a sink for atmospheric CH4; therefore, they can be used to offset agricultural GHG emissions at a farm to national levels. The information will be further used to identify optimal configurations of heterogeneous landscape elements and management practices that lead CH4 uptake, taking into consideration their economic impact.

Research was partially conducted under the project financed by Polish National Centre for Research and Development within of ERA-NET CO-FUND ERA-GAS Programme (ERA-GAS/I/GHG-MANAGE/01/2018).