EGU23-16482, updated on 16 Apr 2024
https://doi.org/10.5194/egusphere-egu23-16482
EGU General Assembly 2023

Measurement of the isotopic signature of boreal wetland methane emissions

Rebecca Fisher[1], Ceres Woolley Maisch[1], David Lowry[1], James France[1,2], Thomas Rockmann[3], Carina van der Veen[3], C. Mary R. Fowler[4], and Euan G. Nisbet[1]

[1]Royal Holloway University of London, Egham, United Kingdom (r.e.fisher@rhul.ac.uk)
[2]Environmental Defense Fund, London, United Kingdom
[3]IMAU, University of Utrecht, Utrecht, Netherlands
[4]Darwin College, University of Cambridge, Cambridge, United Kingdom

The use of δ^2H as well as $\delta^{13}C$ methane isotope measurements will help improve regional and global source apportionment and understanding of reasons for methane's continued and accelerating growth. However more data on regional variability in isotopic signatures of the main sources is required as well as regular measurements of both isotopes in methane in background air.

Field campaigns across Canada in June 2022 and to northern Finland and Norway in August 2022 were carried out to collect air samples for methane $\delta^{13}C$ and δ^2H isotopic characterisation from boreal wetlands.

In Finland and Norway a road campaign with continuous measurements of methane mole fraction was carried out from Södankyla, Finland to Aidejavri, Norway, with a generally decreasing gradient in methane from south to north and this has been compared with land cover maps. Air samples for isotopic analysis were collected at Södankyla, Kaamanen and Lompolojänkkä fens in Finland and Aidejavri and Suossjavri degrading palsa mires in Norway. In Canada δ^2H and $\delta^{13}C$ isotopic signatures were determined in methane emitted by wetlands in northern Ontario including at Fraserdale, and northern Saskatchewan (East Trout Lake).

Overall the mean signatures of emissions from the boreal samples collected were -67‰ for $\delta^{13}C$ and -320‰ for δ^2H, but there was significant local variability when sampling air close to ground level. Aircraft campaigns would be a better way of identifying the integrated isotopic signature of regional wetland emissions (as demonstrated previously for $\delta^{13}C$ signatures across northern European wetlands). Weekly sampling for methane $\delta^{13}C$ and δ^2H was started at Pallas Sammaltunturi in northern Finland in August 2022. These data will be used to identify the regional source signature of emissions.