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Comparison of static chambers to measure N_2O and CH_4 fluxes from soils

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Soil fluxes of the greenhouse gases (GHG) nitrous oxide (N_2O), methane (CH_4) and carbon dioxide (CO_2) are often measured by closed static chambers. During a chamber enclosure the concentration of the target gas changes in the headspace of the chamber. This changes the concentration difference between the soil and the atmosphere and hence also the fluxes from the soil. We hypothesize that the magnitude how much a chamber affects the gas fluxes from the soil is chamber design specific. In addition, the use of inappropriate flux calculation methods can further lead to uncertainties in the flux estimates.

To test different types of static chambers for N_2O and CH_4 flux measurements a chamber calibration campaign was organized at Hyytiälä Forestry Field Station in Southern Finland during August-October 2008. The overall aims of the campaign were to quantitatively assess the uncertainties and errors related to static chamber measurements. Overall 17 different static chambers were tested for five different N_2O and CH_4 flux levels with three different soil conditions (different moisture and porosity) in the chamber calibration system described by Pumpanen et al. (2004).

Preliminary results show that most of the static chambers either over- or underestimated the N_2O and CH_4 fluxes. This chamber specific over- or underestimation remained near constant with different flux levels. However, the deviation varied greatly with different soil porosities. Here we will show the main results of the measurement campaign and give preliminary suggestions for ideal chamber designs, gas sampling protocol and flux calculation methods for N_2O and CH_4 flux measurements.

References:

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