Participation in the workhop "Soil N2O chamber inter-comparison campaign 2014"

Sabine Jordan
TNA request id 794

Please limit the report to max 3-5 pages, including tables and figures.
The report should be sent as a pdf document and include the following subheadings:

- **Introduction and motivation**

As a part of the InGOS activities (Task 5.2, QA/QC chamber flux measurements), an inter-comparison/calibration campaign of soil chamber systems for N2O emission fluxes from soils has been organized by University of Helsinki (UHEL) in June-July 2014. The aim was to gain more knowledge on errors related to chambers for N2O measurements, and also in providing methods to control possible errors. All participants brought their own chambers for sensitivity test of systematic errors related to chamber volume, chamber leaking and pressure changes caused by gas storage in the soil underneath the chamber. The sensitivity of the chambers to errors will be estimated by combining data from different chambers into one dataset. Ideas how to deal with the errors will be further developed during the campaign and scientific knowledge transfer (workshops, article writing, etc.) afterwards.

- **Scientific objectives**

In general, the aim of the inter-comparison campaign was to gain more knowledge on errors related to chambers for measuring N2O emission fluxes, and also in providing methods to control them. Participation in this chamber inter-comparison campaign will give me valuable information about how the N2O emission fluxes from our chamber systems relate to a reference flux and to fluxes measured with other chamber systems. Since the community of people measuring greenhouse gases is enormous, for me, a PhD-student, the campaign was very welcome to test our chamber amongst researchers I only know from literature.

- **Reason for choosing station**

InGOS activity has a tradition at that station.

- **Method and experimental set-up**

Method and experimental set-up was similar to the ones described by Pumpanen et al. (2004) and Pihlatie et al. (2013), but N_2O emission fluxes have been tested this time. An empty tank has been filled up with a high N2O concentration (1000 ppb). The top of the tank was adjustable with a metal sheet that could be moved 10 or 20 cm from the tanks rim (for soil-gas-diffusion measurements). Upon the metal sheet fine sand has been placed where the collars and chambers where situated. The equipment was already established on site by the Finnish crew. Different static, dynamic, flow-through, non-flow-through, vented, non-vented, round and rectangular chambers with different sizes have been tested during the "Soil N2O chamber inter-comparison campaign 2014". See table for working principle and physical dimensions of the chamber:

Chamber	Type 1
Working principle	non-steady-state flow-through
fan	yes/no*
Chamber shape	round
Material of chamber	PVC
Material of collar	PVC
Base diameter/side (m)	0.19
Basal area (m^2)	0.025
Height of chamber (m)	0.16

*We have ambition towards uncertainties related to chamber measurements, e. g. to test the system for type 1 with and without fan.

The chamber was tested at different collar installation depths (2.5, 3.5 and 5 cm) and different soil depths (10 and 20 cm), with different ventilation modes (with and without fan) at different wind speeds. A leakage test was done.

- **Outcome and future studies**

We do not have the results yet. What I could see directly was that the wind speed did not influence the chamber's head space air.

An article is planned which includes results from all tested chamber systems during the campaign. In the future it would be valuable to investigate what type of chamber fits best to different soils and ecosystems. Since we know that those kinds of in-house campaigns do not reflect field conditions I am sure that the different chambers will give us more research and discussion material under different field conditions. A result from this campaign could be that some chambers worked well on sand and under in-house conditions but when it comes to field conditions they might over- or underestimate the emission fluxes (and vice versa for example for chambers that only come into operation at very low N2O emissions under special field conditions).

- **References**

Christiansen, J. R., Korhonen, J. F. J., Juszczak, R., Giebels, M., and Pihlatie, M.: Assessing the effects of chamber placement, manual sampling and headspace mixing on CH4 fluxes in a laboratory experiment, Plant and Soil, 343, 171-185, DOI 10.1007/s11104-010-0701-y, 2011.

Pihlatie, M. K., Christiansen, J. R., Aaltonen, H., Korhonen, J. F. J., Nordbo, A., Rasilo, T., Benanti, G., Giebels, M., Helmy, M., Sheehy, J., Jones, S., Juszczak, R., Klefoth, R., Lobo-do-Vale, R., Rosa, A. P., Schreiber, P., Serca, D., Vicca, S., Wolf, B., and Pumpanen, J.: Comparison of static chambers to measure CH4 emissions from soils, Agricultural and Forest Meteorology, 171, 124-136, DOI 10.1016/j.agrformet.2012.11.008, 2013.

Pumpanen, J., Kolari, P., Ilvesniemi, H., Minkkinen, K., Vesala, T., Niinisto, S., Lohila, A., Larmola, T., Morero, M., Pihlatie, M., Janssens, I., Yuste, J. C., Grunzweig, J. M., Reth, S., Subke, J. A., Savage, K., Kutsch, W., Ostreng, G., Ziegler, W., Anthoni, P., Lindroth, A., and Hari, P.: Comparison of different chamber techniques for measuring soil CO2 efflux, Agricultural and Forest Meteorology, 123, 159-176, DOI 10.1016/j.agrformet.2003.12.001, 2004.