**InGOS TNA 1-2 Activity Report**

**Participation in the workhop “Soil N2O chamber inter-comparison campaign 2014”**

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* **Introduction and motivation**

As a part of the InGOS activities (Task 5.2, QA/QC chamber flux measurements), an intercomparison/calibration campaign of soil chamber systems for N2O was organized by University of Helsinki in June-July 2014. The aim with the campaign was to gain more knowledge on the errors related to N2O chambers, and also in providing methods to control them. I and other participants brought our own chambers for sensitivity test of systematic errors related to 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 tested using the data set.

* **Scientific objectives**

In general, the aim of the inter-comparison campaign was to gain more knowledge on the errors related to chambers for measuring N2O emission fluxes, and also in providing methods to control them. Participation in this chamber inter-comparison campaign can give me valuable information about how the N2O flux from my chamber system relates to a reference flux and to other chamber systems. It can also give us functions which we can use to correct previous measured fluxes and will also give us ideas of improvements of the systems for future measurements.

Specific aims were to (1) measure leaking rate of the chambers at (a) different wind speeds (b) different collar installation depths and (2) to measure the sensitivity for storage problems. Additional specific test for my chamber was to test if the flux will be affected if the fan inside the chamber is on only during short periods (30 seconds every 3rd minute). The purpose with this test was to mimic an ordinary measurement in field, when the fan is only switched on just before an air sample is taken to vials.

* **Reason for choosing station**

The campaign was running at this station.

* **Method and experimental set-up**

Method and experimental set-up in the inter-comparison campaign was similar to the ones described by Pumpanen et al. (2004) and Pihlatie et al. (2013), but N2O flux was tested this time. A tank, which could be filled with high concentration of gas was used, where the top contained of 10 or 20 cm depth of fine sand where the collars and chamber subjected for test was placed. The equipment was already established on site by the Finnish crew. I brought my own dynamic flow-through chamber equipped with fan and pressure vent to test it in the inter-comparison campaign. The chamber was rectangular covering an area of 0,2 m2 and had a height of 23 cm. A water seal was established to prevent leakage between chamber and collar.

* **Preliminary results and conclusions**

Preliminary results showed the chamber underestimates the real flux with 9.1% (±2.9) using a linear fit and 4.6% (±3.0) using an exponential fit. Neither insertion depth of collar nor wind speed affected the flux significantly. One reason for the underestimations of the flux could be that the pressure vent has a too small diameter, which leads to an over-pressure when the chamber is put on the collar and therefore to a lower flux. This was supported by a visible decrease of N2O concentration inside the sand when the chamber was put on. However, the underestimates obtained in our tests are quite small (*cf*. Pumpanen *et al*. 2004). The fifth test showed that the use of a procedure which mimicking an ordinary field measurement underestimated the flux with 8.9% when a linear relation were used, which was the same underestimate as for the other tests, for the linear relationship.

The leak test, showed that the chamber is quite tight. After increasing the N2O concentration about three times inside the chamber in comparison to ambient levels, the concentration decreased by 17.5 ppm h-1.

One improvement of the chamber design could be to create a large vent when the chamber is put on and close it to a small vent when the chamber is on and the measurement is performed. This might solve the pressure problem when the chamber is put on without creating larger leakage.

* **Outcome and future studies**

An article is planned which include results from all tested chamber systems during the campaign. In the future it would also be valuable to investigate the effect of different soils on GHG fluxes. Are the results given in this campaign where sand was use valid for other soil types such as peat, clay or moraine? Another important issue is to investigate if the tests really mimic the ordinary measurements in field.

* **References**

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