Workplan for participation in the InGOS N2O flux measurement campaign

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1. Introduction

From April 15th until April 29th, Flux gradient and chamber measurements will be performed as part of the InGOS N2O flux measurement campaign. Both flux measurement system will be connected to a FTIR (Fourier Transform Infrared Spectrometer), measuring CO2, CH4, CO and N2O.

1. Experimental Details

**Flux Gradient system:**

The flux gradient method is based on the concept of using the gas concentration gradient in the atmosphere to quantify the flux. Besides concentration measurements, determination of an Eddy Diffusivity factor is needed. This can be provided by an on-site anemometer. The flux can be calculated by Fick’s law:



The gradient will be quantified as follows. Air from two different heights will be sampled for half an hour (per hour) and stored in bags. Afterwards, the bags will be analyzed by the FTIR for the gases CO2, N2O, CO and CH4. In a later stage, reanalyzes of the spectra makes it possible to quantify the isotopic composition of the gases. The anemometer data will be provided by RISO. Bag filling will be done for half an hour. For analyses of the air, The FTIR needs 20 minutes.

**Chamber system**

The chamber system is based on the concept of sealing an area of soil by a so called chamber, capturing possible emissions (or uptake) of gases from this piece of soil. The two chambers which will be used were purchased from KIT. The dimensions are 50\*50\*50 cm and transparent. They will be connected in a closed loop with the FTIR. During a chamber measurement, chamber air will be circulated for 20 minutes. During this 20 minutes, the air will be analyzed for CO2, N2O, CO and CH4. In a later stage, reanalyzes of the spectra makes it possible to quantify the isotopic composition of the gases. Every FTIR measurement will take 2 minutes. After 3 measurements (6 minutes), the chamber will close. After 20 minutes, the chamber will open again.

**Measurement cycle**

Every hour, 1 flux gradient cycle and 2 chamber cycles (each chamber ones) will be performed. This will be automated. Besides that, calibration measurement will be performed approximately once in the 2 days.

1. Research Goals

The main goal of this experiment is the inter comparison of different flux measurement techniques and instruments to measure N2O-flux. Therefore, the week before the experiment, the field is fertilized to achieve significant N2O-emissions. Besides this, a 15N tracer study will be performed. A small part of the field will be fertilized with 15N-spiked fertilizer, in order to perform a 15N tracer study.

**15N tracer study**

The 15N-tracer study focuses on the question of determining the source of the N2O-flux. By spiking the fertilizer with 15N, emission caused by this fertilization has a different isotopic signature than the normal ‘background emission. Both flux chambers will be situated in the area with the 15 N-spiked area for this purpose

**N2O Inter comparison**

Flux Gradient data can be used for the N2O inter comparison-study.

Besides this, for some time during the campaign, the FTIR will be connected to a flux chamber, brought by KIT. By measuring the flux, using the same chamber, a comparison of the methods is possible. During this time, the 15N tracer study will be not active.

1. Logistics

To be determined