

ClimMani

ES1308 COST ClimMani STSM report

After an STSM supported by ClimMani we request that the participant provides a short report to the STSM manager (bogdan.chojnicky@gmail.com) following the below outline. Deadline: No later than 4 weeks after return. No reimbursement of travel costs will be made until the STSM report has been submitted.

STSM applicant (Name and affiliation) MARTIN MADDISON University of Tartu, Institute of Ecology and Earth Sciences, Department of Geography
Gender and scientific experience Male, PhD in Environmental Technology
Host (person and affiliation) Prof. Bjarni D. Sigurdsson Agricultural University of Iceland, Department of Environmental Sciences
Time of the STSM 10 th – 18 th august 2016
Title/subject of the STSM Measurements of N ₂ emission from soil along natural warming gradient in FORHOT experimental plots using the gas-flow-soil-core technique
Main purpose of the STSM and relevance to <i>ClimMani</i> The main purpose of the STSM was to collect soil samples for the measurement of nitrogen (N ₂) emissions from the naturally warmed soil at the FORHOT experiment. Current STSM in FORHOT experimental area is consistent with goals of the COST Action ClimMani to stimulate the international collaboration in extremely complex studies of terrestrial ecosystems responses to climate change.
<i>ClimMani</i> WG to which the STSM is most relevant Current STSM is most relevant to Gradient studies working group (2).
Outcome/result/conclusions of the STSM (main report) The main outcome of this research is quantifying the magnitude of N ₂ emission from FORHOT grasslands and forest sites. We assume that N ₂ -losses from natural warming soils are affected by the increase of soil temperature. The gas-flow-soil-core technique is based on the replacement of the soils atmosphere by an N ₂ -free atmosphere, thus allowing direct measurement of N ₂ emission from the soil due to denitrification.

The soil cores will be placed in air tight incubation vessels and be flushed with HeO gas mixture up to 36 hours to remove N₂ from soil atmosphere.

There were collected 108 soil core samples for N₂ measurements from two soil depths close to each FORHOT CH₄ and N₂O measurements plots (6 temperature level) at 3 transects in old and new grassland and forest experiments (Figure 1).



Figure 1. Soil-core sampling at FORHOT forest (A) and grasslands (B) sites.

There were measured also soil temperature at each soil core sampling points at both depth. Soil temperature varied from 10.8 to 46.8 °C.

The incubation system has the temperature control unit to reproduce field conditions (Figure 2).



Figure 2. The measuring system (A) and the incubation vessel (B) to simultaneously quantify N₂ emissions from intact soil cores.

N₂ measurements are time consuming because of long flushing time and limitation to control temperature of each incubation vessel. It is possible to analyze samples at the same time with the same temperature.

According to results of soil temperature, all 108 samples were divided into groups of 5-6. It will take at least 10 weeks to analyze all collected samples.

Analysis of samples started in August and will be finished in October.

Evaluation of the STSM (bullet-points on to what extent did it contribute to advance science, build experience, build network)

- STSM offered an opportunity to participate in studies at FORHOT experimental sites.
- Results of N₂ fluxes from FORHOT experiment are unique and will help understand N₂-losses from forest and grassland ecosystems due to soil natural warming.
- Analysis of the results together with other groups working on different responses of plant ecosystems at the same sites will help to develop the scientific contacts.

Planned publications and timing

After the analysis of samples and data, I will continue analysis of the result together with other groups working at the FORHOT sites. Publications and timing will be decided together with other involved working groups.

The results of this study will be published in a paper and CLIMMANI will be acknowledged in it.

Further work

I will continue developing and working with the gas-flow-soil-core technique for N₂ measurements. Due to the importance of N₂-loss from forest and grassland ecosystems, more experiments are urgently needed to get a better insight in factors driving the magnitude of N-gas emissions.