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Project: "Robotized emission measurements"

Gas exchange between soil and atmosphere:

A newly constructed robot for measuring emission of N_2O from field experiments will be rigorously tested and the performance documented. The Field Flux Robot (FFR) is an autonomous vehicle with high precision GPS which measures N_2O emission with a unique fast box technique: chambers are landed onto the soil with a soft collar (no frames) and the concentration of N_2O is measured with TDL (laser) with high frequency of measurements (10 Hz). Crucial features to be tested are 1) the spatial precision of movements 2) necessary time for estimating N_2O emission (expected: 1-2 min on each spot) 3) quantification of leakage effects 4) possible routines and algorithms for robust estimation of leaks. JRK will be responsible for the testing together with members of UMB Nitrogen group and the SME company ADIGO (NORA partner 12).

Field experiment: A new field plot experiment will be established early spring 2014, to rigorously test the effect of soil pH management. Hypotheses: 1) Strong liming results in a transient increase in N_2O, followed by a gradual decline below the emissions in unlimed plots 2) slow reacting mafic rocks will result in more moderate (and slower) increase in pH, thus gradually lowering the N_2O emissions 3) emissions from the various treatments correlates with the N_2O-index measured by standardized anoxic laboratory incubations (Qu *et al.* , Global Change Biology 2013

FFR-Campaigns: Secondments at Yara and UGOT will involve field campaigns with FFR to map spatial variability of N_2O emissions within existing field plot experiments (Yara) and within the fetch areas of micrometeorological installations (UGOT).

Laboratory studies: soils from field experiments will be studied in more detail in the laboratory, both by standardized anoxic incubations (Qu *et al.* 2013) and by molecular analyses (DNA and transcripts) in collaboration with the team at UMB. JRK will also be involved in studies of nitrite kinetics in soils, using 15N techniques to trace the fate of nitrite in soil (oxidation, nitrosation, DNRA or reduction to NO). Secondment at UGOT will be used to explore options for a collaborative study (UGOT and UMB) of such phenomena.

UMB nitrogen group has initiated a study of "selective pressure" on denitrifying bacteria in soil (short versus long anoxic spells). JRK will join this work where molecular analyses are used in tandem with process studies.

It may sound trivial, but the effect of soil storage (after field sampling) on the microbial characteristics of soils (genetic and kinetics of nitrogen transformations during incubations) needs to be studied (for practical reasons, soils are often stored for some time in moist cold conditions before being "processed" be it for genetic analyses or for testing their biological potential). The study will focus on variables relevant for NORA.