Climate & Environmental Change – MAIOLICA

Land Ecosystem Experiments

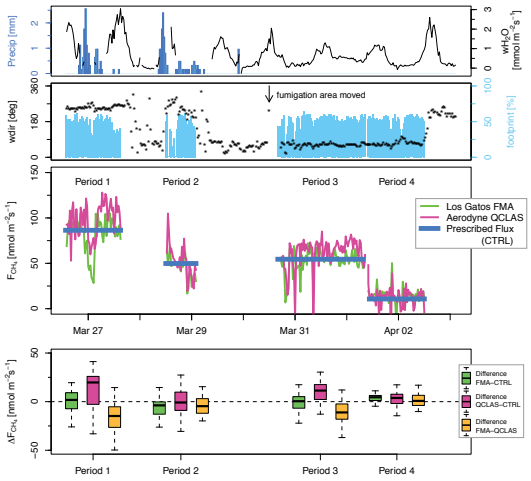
Werner Eugster[1], Rebecca Hiller[1], Dominik Brunner[2], Bela Tuzson[2], Brigitte Buchmann[2], Lukas Emmenegger[2], Bruno Neininger[3], Carsten Schubert[4], Elke Hodson[5], Jacqueline Stieger[1], Nina Buchmann[1]

[1] *ETH Zurich, Grassland Science Group, Institute of Plant, Animal and Agroecosystem Sciences, Zürich, Switzerland*
[2] *Empa Material Science & Technology, Dübendorf, Switzerland*
[3] *Metair AG – meteorological airborne observations, Hausen a. Albis, Switzerland*
[4] *eawag, SURF, Kastanienbaum, Switzerland*
[5] *Swiss Federal Research Institute WSL, Birmensdorf, Switzerland*

Contact:
Werner Eugster, ETH Zurich, Universitätsstrasse 2, 8092 Zürich, Switzerland, ✆ +41 44 632 6847, e-mail: werner.eugster@agrl.ethz.ch, URL: www.maiolica.ch

Methane Flux Accuracy

In addition to the standard H_2O and CO_2 flux measurements the MAIOLICA project focuses strongly on CH_4. An important aspect is the accuracy of direct CH_4 flux measurements.



Experimental conditions

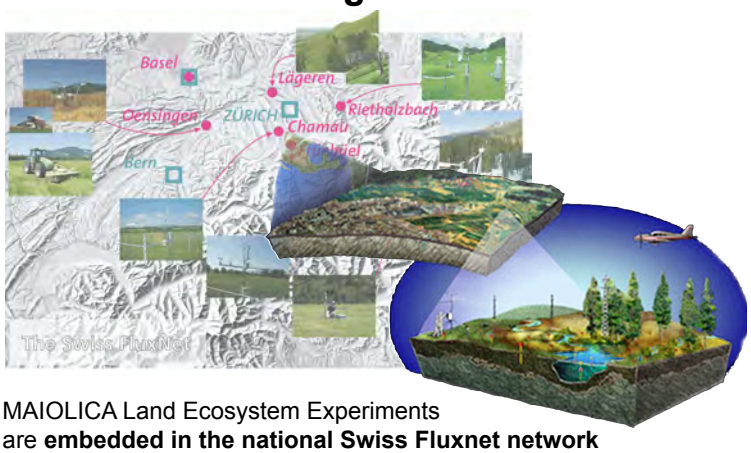
CH_4 fumigation of ca. 60% of flux footprint area

Good agreement with prescribed flux

Accuracy: within a few tens of nmol CH_4 $m^{-2}s^{-1}$

Direct flux measurements of methane with the eddy covariance method are still scarce. The MAIOLICA consortium successfully showed that state-of-the-art flux measurements are able to reproduce a prescribed methane flux with high accuracy (lowest panel). **Agreement with prescribed flux is good for both FMA (Fast Methane Analyzer) and QCLAS (Quantum Cascade Laser Absorption Spectrometer) system.**

Swiss Fluxnet: Long-term GHG Fluxes

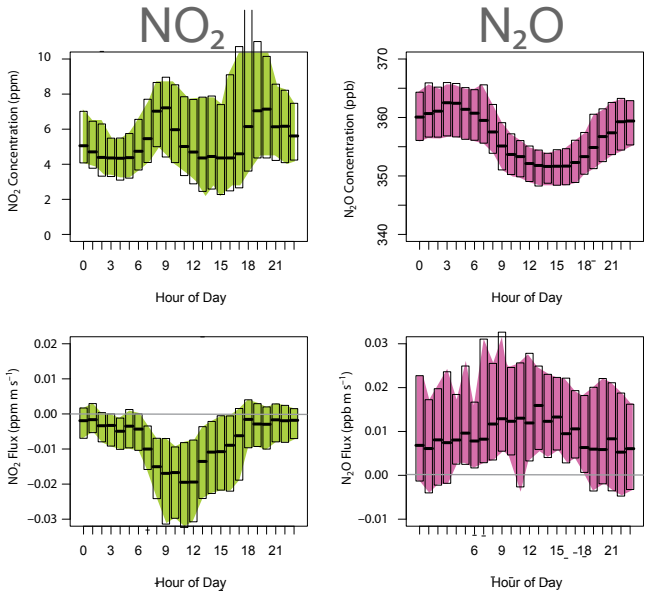


Overlay from http://www.neoninc.org/sites/default/files/NEON_2007_v5_2_WithAttribution_rev0709.jpg

MAIOLICA Land Ecosystem Experiments are **embedded in the national Swiss Fluxnet network** of eddy covariance flux sites with continuous long-term measurements of H_2O and CO_2 fluxes. It extends our insights into land surface interactions with the climate system with the additional key greenhouse gases CH_4 and N_2O. A strong linkage with aircraft measurements (Activity 1c) allows for **regional flux estimates**.

Additional Trace Gases: NO_2, N_2O

Efforts were made to extend our capability to perform eddy covariance measurements of trace gas fluxes beyond H_2O, CO_2 and CH_4. Successful measurements were done with a **Quantum Cascade Laser Absorption Spectrometer** (QCLAS) for N_2O and NO_2.



Measurements at the Chamau grassland site show a **clear uptake of NO_2** with a pronounced diurnal cycle, and a clear but **small N_2O efflux** with a weak diurnal cycle.

Conclusions

- CCES activities have strengthened the long-term flux measurements of CO_2 and H_2O in Swiss Fluxnet
- Strong focus on CH_4 concentration and flux measurement techniques is unique in global context
- QCLAS developments and application for flux measurements is a cutting-edge research component
- Within MAIOLICA, surface boundary conditions were measured for the regional integration component