FIRST RESULTS OF TALL TOWER SURFACE-ATMOSPHERE N_2O MEASUREMENTS OVER A MIXED AGRICULTURAL REGION IN CENTRAL EUROPE

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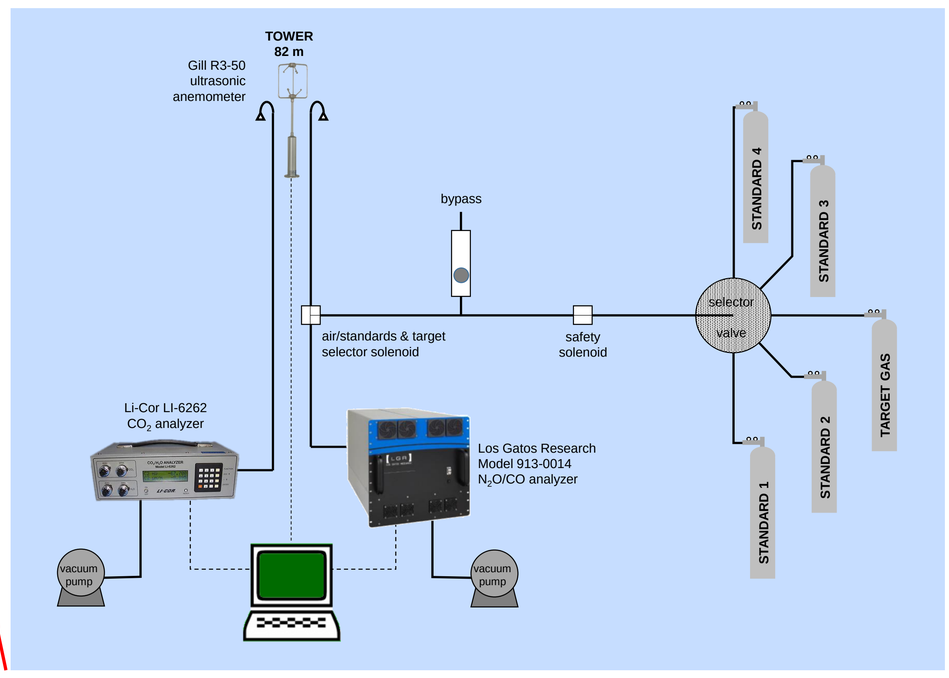
Introduction

Climate change caused by the steadily increasing atmospheric amount of greenhouse gases is one of the biggest challenges humankind faces today. For reliable predictions we need to monitor the atmospheric changes and understand the underlying processes. A Los Gatos Research Model 913-0014 fast response N_2O analyzer was inserted into our existing monitoring system in May, 2015, to track both the trend of the atmospheric N_2O concentration and the surface-atmosphere N_2O budget. The poster presents the first measurement results.

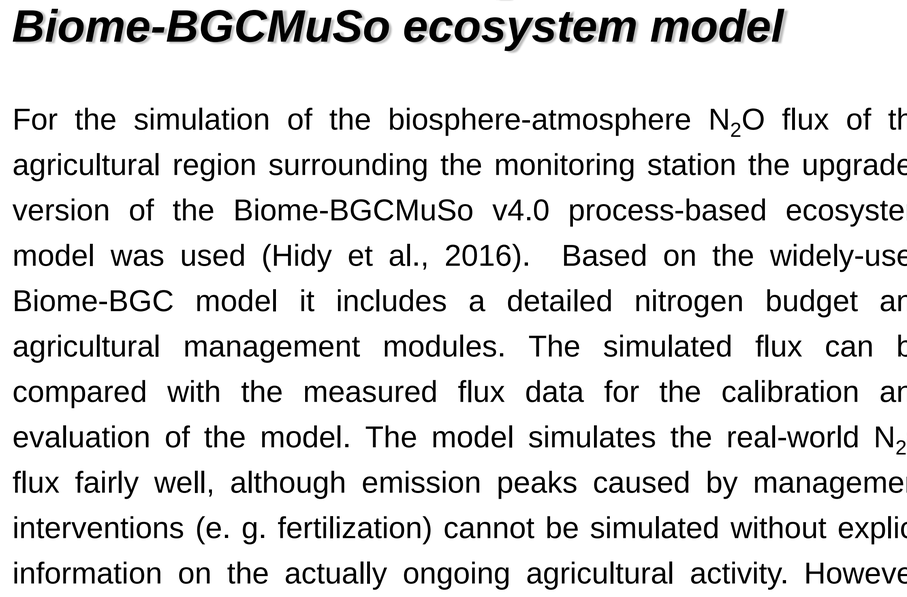
Monitoring system and location

At Hegyhátsál tall tower GHG monitoring site (Hungary; 46°57'N, 16°39'E, 248 m asl) a large footprint eddy covariance system monitoring the surface-atmosphere CO_2 flux of the surrounding dominantly agricultural region is mounted at 82 m above the ground on the tower and it has been in operation since 1997 (Haszpra et al., 2005). It was completed with a fast response N_2O analyzer in May, 2015. The air intake of the N_2O analyzer was collocated with that of the CO_2 analyzer. This configuration allows to operate the N_2O eddy covariance system and the CO_2 eddy covariance system sharing a single ultrasonic anemometer. The monitoring system is operated at 4 Hz. The N_2O analyzer is carefully calibrated against 4 standards prepared and certified by MPI-BGI, Jena, Germany.



Surface-atmosphere N_2O flux and the Biome-BGCMuSo ecosystem model

For the simulation of the biosphere-atmosphere N_2O flux of the agricultural region surrounding the monitoring station the upgraded version of the Biome-BGCMuSo v4.0 process-based ecosystem model was used (Hidy et al., 2016). Based on the widely-used Biome-BGC model it includes a detailed nitrogen budget and agricultural management modules. The simulated flux can be compared with the measured flux data for the calibration and evaluation of the model. The model simulates the real-world N_2O flux fairly well, although emission peaks caused by management interventions (e. g. fertilization) cannot be simulated without explicit information on the actually ongoing agricultural activity. However, generally, the model can be applied for filling the gaps in the measured data series.

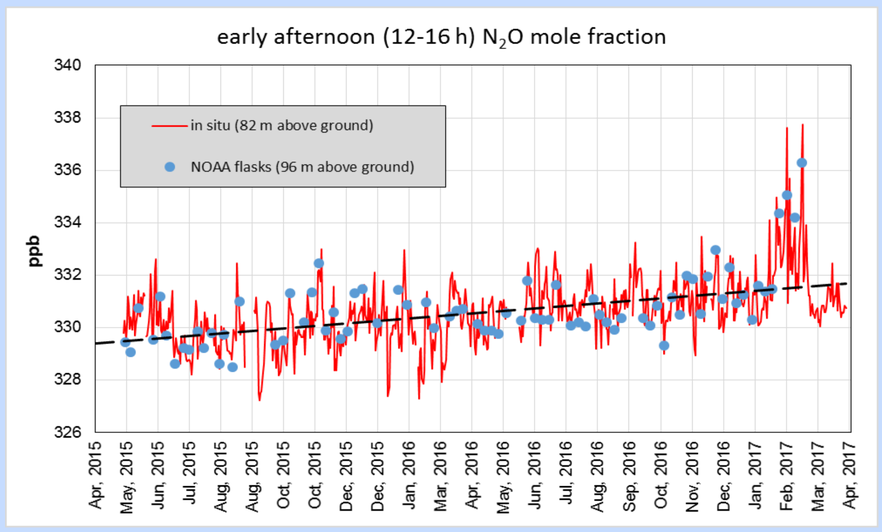


Estimated total annual N_2O emission for 2016: **200 mg N/m²**

Robust quality control and uncertainty estimation are in progress.

Temporal variation in N_2O concentration

At 96 m above the ground, 14 m above the eddy covariance systems, there is a NOAA flask air sampling site. The weekly flask air samples offer the possibility of a qualitative comparison of the measurements. Average deviation is 0.11 ± 0.47 ppb.



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- Hidy et al., 2016: Terrestrial ecosystem process model Biome-BGCMuSo: Summary of improvements and new modeling possibilities. *Geosci. Model Dev. 9,:4405-4437.* doi: 10.5194/gmd-9-4405-2016

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