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Measuring CH_4 and N_2O fluxes using quantum cascade laser spectrometry on peat lands

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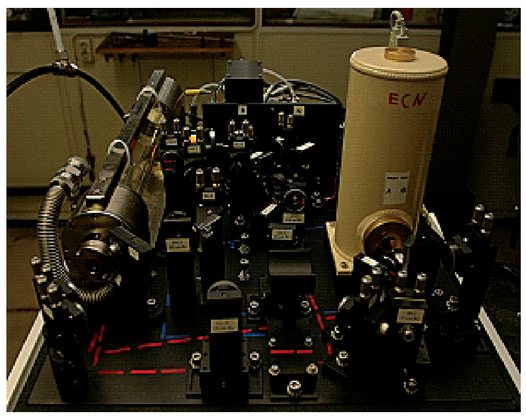
Introduction

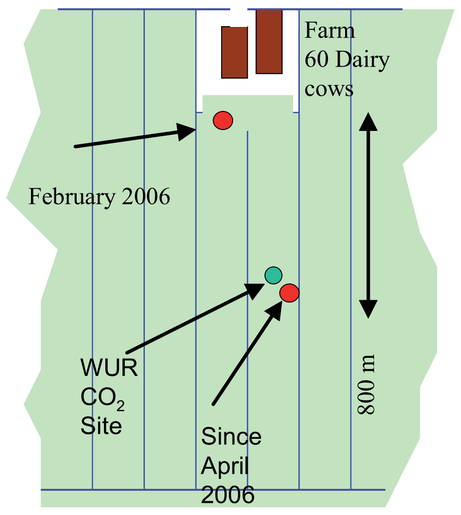
- A quantum cascade laser spectrometer (Aerodyne Research Inc.) is used for eddy covariance and fast box measurements of CH_4 and N_2O exchange over an intensively managed peat grassland at Reeuwijk in the Netherlands (N 52º01'15", E 4º01'17").
- Results of two measurements campaigns are shown. A test campaign was done after the first manure application (129 kg N/ha cow-manure) in February 2006. A second campaign was performed after the second application (27 kg N/ha artificial fertilizer and 69 kg N/ha cow-manure) in May 2006. The system has been continuously running since April 2006.



Quantum cascade laser:
- Multipass cell 0.5 l
- Inlet 25 m and ¼ inch
- Varian Vacuum pump

Measurement set-up

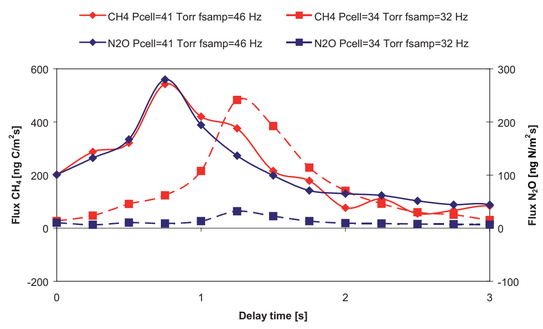
- The test campaign was performed at the edge and the second campaign in the middle of the field.
- EC-measurements were done at a sampling frequency of 10Hz.
- Box-measurements were performed at 30 and 7 locations.



Calibrations and sampling frequency

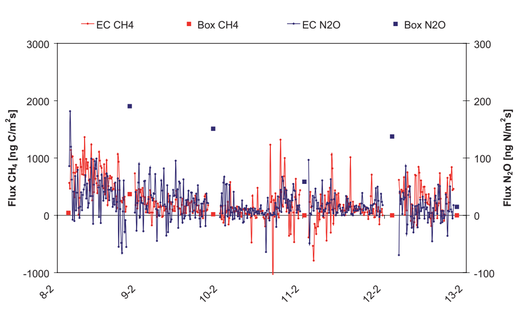
- Difference between concentration level from spectral and gas flask is very high. A two point calibration is required.
- A sampling frequency of 10Hz can be obtained using the quantum cascade laser.

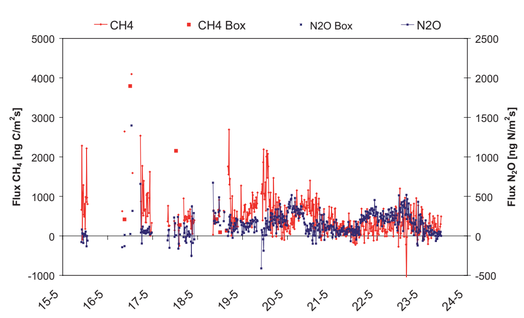
Comp	low	high	low and high
CH_4	4% ± 4%	14% ± 3%	20% ± 6%
N_2O	3% ± 6%	7% ± 5%	12% ± 5%



Results

- Average fluxes were 20 ± 29 ng N/m²s and 243 ± 327 ng C/m²s in February and 146 ± 151 ng N/m²s and 457 ± 469 ng C/m²s in May 2006.





Conclusions and acknowledgments

- Average fluxes were higher in May than in February 2006, 20 N/m²s and 243 ng C/m²s in February and 146 ng N/m²s and 457 ng C/m²s in May, respectively. A sampling frequency of 10Hz can be obtained. A two-point calibration is required and calibrations should be done at least once a day.
- The help of Mark Zahniser (Aerodyne Research Inc.) and the farmer Theo van Eyk is gratefully acknowledged.
- The project is carried out in the framework of the Dutch BSIK program in cooperation with Wageningen University and VU Amsterdam.

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July 2006