



[NORA-ICOS-SITES workshop:](#)

***"Gas flux measurements in terrestrial ecosystems
- state of the art and emerging technologies"***

10. – 13. May 2015, Gothenburg, Sweden

Jointly organized by the Marie Curie ITN [NORA](#), [ICOS Sweden](#), and [SITES](#)



"The development of new technologies is a prerequisite for progress in the research of trace gas emissions from ecosystems. Various robotized solutions have been developed or are in the making, which are excellent platforms for implementation of novel spectroscopic instruments. Such new approaches open new possibilities and applications, particularly in field experiments. This meeting will bring together front runners in this field to present current and discuss future developments.

The main focus of this workshop is on N₂O, but presentations of techniques approaching other trace gases are appreciated as well.

We welcome the participation of students as well as researchers with interest in the topic."

hosted by the [Department of Earth Sciences,](#)
[University of Gothenburg,](#) Sweden



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GOTHENBURG





Programme

Sunday, 10.05.2015:

19:00: Ice Breaker Party ([Department of Earth Sciences](#), University of Gothenburg ([Guldhedsgatan 5A, 413 20 Gothenburg](#)))

Monday, 11.05.2015: N₂O emission measurements - requirements, experiences and challenges

([Conference Centre Wallenberg](#), [Medicinaregatan 20 A, 413 90 Gothenburg](#))

Sessions:

08:30: Welcome and introduction

- 08:30: Klemedtsson, Leif (University of Gothenburg, SE): Welcome and presentation of SITES
- 08:50: Lindroth, Anders (Lund University, SE): "ICOS Sweden – a national infrastructure network for greenhouse gas research"
- 09:10: Frostegård, Åsa (NMBU, NO): "NORA – Nitrous Oxide Research Alliance; From biochemistry to field emissions"

09:30: Biological processes

- 09:30: Butterbach-Bahl, Klaus, Ralf Kiese, Benjamin Wolf (IMK Garmisch-Partenkirchen, DE): "Measuring soil N₂O and other GHG fluxes while disentangling involved processes - challenges of scale"

10:10: Coffee break

10:30: Biological processes (continued)

- 10:30: Wu, Di, Mehmet Senbayram, Nicolas Brüggemann, Klaus Dittert, Roland Bol (FZ Jülich, DE): "Nitrification inhibitors mitigate fertilizer derived N₂O emissions under conditions favoring denitrification"
- 11:00: Bakken, Lars R. (NMBU, NO): "Ecophysiology of N₂O emissions, new insight from studies of model organisms"
- 11:30: Nadeem, Shahid, Lars Bakken, Jan Reent Köster, Pål Tore Mørkved, Nina Simon, Peter Dörsch (NMBU, NO): "Greenhouse gas mitigation from cultivated soils by pH management using mafic rock powders: a field experiment"

12:00: Lunch break



12:45: Poster session (list of poster presentations below)

14:00: Modelling of N₂O fluxes

- 14:00: Jansson, Per-Erik, Leif Klemedtsson, Hongxing He, Åsa Kasimir (KTH, SE): "Modelling of N-emissions – Experiences of CoupModel applications for forests and agricultural land"
- 14:30: Lammirato, Carlo, Ulrike Lebender, Jens Tierling, Joachim Lammel (Yara, DE): "N₂O emissions from a field experiment on fertilization of agricultural soil: measured vs modelled fluxes"
- 15:00: Hassan, Junaid, Zhi Qu, Linda Bergaust, Lars Bakken (NMBU, NO): "Modelling the denitrification regulary phenotype of *Paracoccus denitrificans*: a fraction of the batch culture producing Nar, NirS, and cNor nut the entire population producing NosZ"
- 15:30: Molstad, Lars (NMBU, NO): "Flux calculations from leaky chambers"

15:45: Coffee break

16:00: Micromet techniques

- 16:00: Fowler, David, Ute Skiba, Pete Levy (Centre for Ecology & Hydrology, UK): "Comparisons between micrometeorological and chamber methods - theory and practice"
- 16:30: Klemedtsson, Leif, Anna Hedenrud, Per Weslien, Anders Lindroth, Sophie Rychlik, Åsa Kasimir (University of Gothenburg, SE): "The nitrous oxide emissions from a willow bio-energy plantation fertilized with mineral N-fertilizer as well as sewage sludge, measured with eddy covariance and automatic chamber techniques"
- 17:00: Merbold, Lutz, Lukas Hörtnagl, Kathrin Fuchs, Werner Eugster (ETH Zürich, CH): "No memory effects of grassland restoration on N₂O exchange of intensively managed grassland in Switzerland"
- 17:30: Vestin, Patrik, Meelis Mölder, Elin Sundqvist, Margareta Hellström, Anders Båth, Irene Lehner, Per Weslin, Leif Klemedtsson, Anders Lindroth (Lund University, SE): "Continuous multi-plot measurements of CO₂, CH₄, N₂O and H₂O in a boreal forest – The importance of accounting for all greenhouse gases"

18:10: Discussions on ICOS protocol development for Eddy Covariance measurements of non-CO₂ greenhouse gas emissions (to be continue on Tuesday on the bus and Tuesday evening)

19:30: conference dinner (Conference Centre Wallenberg)



Tuesday, 12.05.2015: Field trip with demonstrations

08:00: Departure at Conference Centre Wallenberg

- NMBU field robot for N₂O and CO₂ measurements (Köster, Jan Reent, Lars Molstad, Torggrim Lien)
- Eddy covariance system with N₂O and CH₄ laser
- VOC emission measurements using Eddy Covariance and Proton Transfer Reaction Mass Spectrometry (PTR-MS) (Holst, Thomas)
- Laser-based isotope analyses using Cavity ring-down spectroscopy (CRDS)

→ Coffee and lunch will be served during the field trip

~19:00: ICOS protocol work meeting (continued) incl. dinner (ICOS members only)

Wednesday, 13.05.2015: State of the art and emerging technologies

Sessions:

08:00: Stable isotope techniques

- 08:00: Well, Reinhard, Caroline Buchen, Marianna Deppe, Anette Giesemann, Dominika Lewicka-Szczebak, Lena Rohe (Thünen Institute, DE): "Progress in the determination of N₂O processes in soil using stable isotope approaches"

08:30: Lasers and fast box approaches

- 08:30: Nelson, David D., Barry McManus, Scott Herndon, Joanne Shorter, Dylan Jervis, Tara Yacovitch, Mark Zahniser (Aerodyne Research, US): "Measuring the Drivers of Global Climate Change: Using Mid-IR Lasers to Quantify Atmospheric Greenhouse Gases"
- 09:00: Mohn, Joachim, Lukas Emmenegger (EMPA Dübendorf, CH): "Laser spectroscopic analysis of GHG stable isotopes: recent advances and perspectives"

09:30: Coffee break

10:00: Lasers and fast box approaches (continued)

- 10:20: Leggett, Graham, Rob Peters, Nabil Saad, Yonggang He, Don Herman, Whendee Silver, Heather Dang (Picarro Inc., US): "Comparison of a Gas Chromatograph and a Cavity Ring-down Spectrometer with Soil Flux Processor for Flux Quantification of Nitrous Oxide, Carbon Dioxide and Methane in Closed Soil Chambers"



- 10:30: Barthel, Matti, Charlotte Decock, Benjamin Wilde, Christopher Mikita, Joachim Mohn, Johan Six (ETH Zürich, CH): "On-line assessment of $\delta^{15}\text{N}_\alpha$, $\delta^{15}\text{N}_\beta$ and $\delta^{18}\text{O}$ of soil-derived N_2O using quantum cascade laser spectroscopy"
- 11:00: Jost, H.J., Eric Wapelhorst, Hans-Juergen Schlueter, Oliver Kracht, Jens Radke, Magda Mandic, Laura Gangi, Roland Bol, Nicolas Brüggemann, Huilin Chen, Harro Meijer (Thermo Fisher Scientific, CH): "Investigating biosphere-atmosphere exchange with a field deployable isotope ratio infrared spectrometer for simultaneous measurements of carbon and oxygen isotopologues of CO_2 "

11:30: Robotic field platforms and automated systems

- 11:30: Ineson, Phil (University of York, UK): "Automating greenhouse gas flux measurements - why bother?"

12:00: Lunch break

12:45: Robotic field platforms and automated systems (continued)

- 12:45: Wolf, Benjamin, Eugenio Diaz-Pines, Klaus Butterbach-Bahl, Ralf Kiese (IMK Garmisch-Partenkirchen, DE): "Robotic greenhouse gas (GHG) measurements in the TERENO-prealpine observatory"
- 13:15: Dörsch, Peter, Lars Molstad, Jan Reent Köster, Audun Korsæth (NMBU, NO): "Automated GHG measurements along transects: use of a cable operated chamber with FTIR - a concept study"
- 13:40: Görres, Carolyn-Monica, Claudia Kammann, Reinhart Ceulemans (University of Antwerp, BE): "Field comparison of two commercially available automated chamber systems for soil CO_2 flux measurements"
- 14:10: Köster, Jan Reent, Lars Molstad, Peter Dörsch, Audun Korsæth, Lars Bakken (NMBU, NO): "Development and deployment of an autonomous field robot for laser-based N_2O flux measurements"
- 14:30: Overskeid, Øyvind (Adigo, NO): "Outlook - Future of robotics"

15:00: Klemedtsson, Leif (University of Gothenburg, SE): Closing and farewell

15:15: Coffee



Posters (to be presented during poster session on Monday, 11. May, 12:45)

Biological processes:

- Andres, Monique, Thomas Kreuter, Jürgen Augustin (ZALF, DE): “Application technique and nitrification inhibitor affects Nitrogen gas emissions and Nitrogen budgets”
- Forrester, P.J., D.J. Krol, G.J. Lanigan, K.G. Richards (Teagasc Wexford, IE): “Urine patch simulation approach: effects on nitrous oxide emissions”

Micromet techniques:

- Bergsten, Alexander, Achim Grelle, Bengt Norén (In Situ Instrument AB, SE): “New components for reliable environmental measurements”
- Grelle, Achim, Alexander Bergsten, Bengt Norén (In Situ Instrument AB, SE): “The ICOS Sweden technology”
- Hörtnagl, Lukas, M. Bahn, M. Barthel, N. Buchmann, W. Eugster, K. Klumpp, T. Ladreiter-Knauss, G. Wohlfahrt, L. Merbold (ETH Zürich, CH): “Management influence on N₂O fluxes over Central European grasslands”
- Köster, Jan Reent, Andreas Pacholski, David Griffith, Tom Denmead, Deli Chen, Karl H. Mühlhling, Henning Kage, Klaus Dittert (Uni Kiel, DE / NMBU, NO): “Validation and application of open-path Fourier Transform Infrared Spectroscopy for quantification of N₂O, CH₄, and NH₃ emissions from open anaerobic digestate lagoons”

Stable isotope techniques:

- Jasek, Alina, Zbigniew Gorczyca, Mirosław Zimnoch, Stanisław Węglarczyk (Uni Krakow, PL): “Multiple chamber system for soil carbon dioxide isoflux measurements”
- Köbke, Sarah, Mehmet Senbayram, Klaus Dittert (Uni Göttingen, DE): “Oilseed rape straw incorporation to soil does not affect post-harvest N₂O emissions”
- Wallman, Magdalena, Tobias Rütting, Sofia Delin, Leif Klemedtsson (University of Gothenburg, SE): “Closing the nitrogen budget in arable fields with different fertilization”

Robotic field platforms and automated systems:

- Carolan, Rachael, G.J. McNeill, K.L. McGeough, Y. Devlin, C.J. Watson (Uni Belfast, UK): “Assessing the effectiveness of an automated chamber system vs manual static chamber measurements of N₂O emissions in grassland”
- Zimmermann, Michael, Sonja Leitner, Nermina Saronjic, Sophie Zechmeister-Boltenstern (Uni Vienna, AT): “The impact of extreme weather events on soil N₂O, CO₂ and CH₄ fluxes as measured by an automatic chamber system”



Lasers and fast box approaches:

- Yi, Hongming, Olivier Laurent, Weidong Chen, Michel Ramonet, Rabih Maamary, Eric Fertein (University of the Littoral Opal Coast, FR): “Measurements of livestock CH₄ emission using quartz-enhanced photoacoustic absorption spectrophone”

Soil cover techniques:

- Cowan, N., D. Famulari, M. Anderson, P. Levy, U. Skiba (Centre for Ecology & Hydrology, Edinburgh, UK): “Developing a Dynamic Chamber Method with a Quantum Cascade Laser”
- Korkiakoski, Mika, Markku Koskinen, Pentti Arffman, Paavo Ojanen, Kari Minkkinen, Tuomas Laurila, Annalea Lohila (Uni Helsinki, FI): “Annual and diurnal cycles of CH₄ flux measured by the automatic chambers in a well-growing forestry-drained peatland”

Acknowledgments

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