Invitation/Programme

VDI/DECHEMA/GDCh Expert Forum on Atmospheric Chemistry

07/08 March 2018

DECHEMA Society for Chemical Engineering and Biotechnology e.V., Frankfurt (Main), Germany

Agriculture and livestock farming: Impact on air quality and climate

The 4th Expert Forum on Atmospheric Chemistry (EFAC 4) is organized by the VDI/DIN-Commission on Air Pollution Prevention supported by

Foreword

The invention of the Haber-Bosch-process has caused unprecedented changes in global nitrogen cycles, converting atmospheric N_2 into various reactive nitrogen compounds. The increased use of nitrogen fertilizers (ammonium salts or urea) allowed for a growing world population. However, it also resulted in increased emissions of reactive nitrogen compounds into the Earth's atmosphere and thereby caused severe effects on the environment and on human health. N-fluxes are influencing acidification, eutrophication, global warming, and biodiversity. Therefore, soil quality, water quality, air quality, ecosystem exposure to nitrogen deposition, biodiversity, and climate change are coupled problems.

In general, the agricultural sector is the largest contributor to global anthropogenic non-CO_2 greenhouse gas (GHG) emissions. The future challenge is the implementation of mitigation measures within the agricultural sector. The mitigation measures are necessary to avoid a further increase of the mainly nitrogen-related emissions, while meeting the growing global demand for animal-based food. About a quarter of the global GHG emissions result from agriculture, forestry and other land use. Deforestation, agricultural emissions from soil, nutrient management, livestock, and fossil fuel belong to the major sources. Emissions of CO_2 and CH_4 mainly result from livestock farming whereas N_2O-emissions mainly result from manure storage, agricultural soils and biomass burning. The emissions of N_2O are closely linked to the efficiency of nitrogen-utilisation within the major pathways of a livestock system.

In addition, the agricultural sector is a significant contributor to emissions relevant to air quality. About 95% of the NH_3 emissions are caused by agricultural activities. NH_3, in turn, influences the formation of secondary aerosols (e.g. ammonium nitrate and ammonium sulfate). The cultivation of soil and the farming of animals is also a source of primary (biological) aerosols. Moreover, agricultural activities release NO and organic compounds that result from biochemically induced nitrification processes as well as from the decomposition of undigested proteins in the dung of farm animals and the biogenic emissions of crops, respectively.

The overarching aim of EFAC 4 is the assessment of the environmental impact of agriculture and livestock farming. Finally, it is intended to derive recommendations for mitigation strategies and reduction technologies and to point out future research needs:

Emissions from agriculture, forestry and other land use

Food systems contribute 19% - 29% of global anthropogenic GHG emissions. Agricultural production, including indirect emissions associated with land-cover change, contributes 80% - 86% of total food systems emissions, with significant regional variation. This session introduces promising interventions for emission reduction measures, reductions in waste, increased nitrogen efficiency, and reduction of losses of soil carbon stocks.

Particulate matter: emissions – dispersion – ambient concentrations

Agricultural activities like cultivation of soil and farming of animals are sources of primary fine particles. However, some 30% - 50% of the urban background particulate matter pollution can be attributed to secondary aerosols, which are those that are made up of gaseous precursors. The development of the secondary inorganic aerosols such as ammonium nitrate and ammonium sulfate is determined by the concentration of NH_3. According to latest estimates, the emissions of NH_3 from agriculture in Germany will further slightly increase until at least 2020. This session will provide an overview of trends in particulate matter emissions (directly and indirectly emitted) from agricultural activities and the resulting consequences for future abatement strategies.

The role of VOCs in atmosphere-biosphere interactions

The abundant and diverse range of volatile organic compounds (VOCs) plays an important role in the Earth system at different spatial scales. Depending on tropospheric conditions, VOC emissions can impact air quality and radiative forcing, leading to complex feedbacks in the Earth system. This session addresses persisting uncertainties with regard to measuring and modelling VOCs in atmosphere-biosphere interactions.

Reactive nitrogen in the atmosphere-biosphere system

Reactive nitrogen compounds consist of reduced nitrogen, oxidized nitrogen, and organic nitrogen compounds. Nitrogen oxides have little impact on ecosystems close to the emission sources since they are emitted as NO and NO_2 exhibiting low dry deposition rates. These compounds need to be converted into nitric acid before deposition is efficient. NH_3 has a high impact near the emission sources due to high dry deposition rates. Ammonia may therefore have significant impact on ecosystems in areas with intense agricultural activity leading to high ammonia emissions. Both NH_3 and NO/NO_2 lead to formation of aerosol phase compounds (ammonium and nitrate) which are transported over long distances. Very little is known about organic nitrogen compounds. This session highlights the significant need for studies of fluxes of reactive nitrogen compounds over sensitive ecosystems.

Speakers

Prof. Dr. Klaus Butterbach-Bahl	Karlsruher Institut für Technologie, Garmisch-Partenkirchen
Dr. Marcus Clauß	Thünen-Institut für Agrartechnologie, Braunschweig
Prof. Dr. Jan Willem Erisman	Vrije Universiteit Amsterdam, Amsterdam
Prof. Dr. Heinz Flessa	Thünen-Institut für Agrarklimaschutz, Braunschweig
Prof. Dr. David Fowler	Centre for Ecology & Hydrology, Edinburgh
Prof. Dr. Martin Heimann	Max-Planck-Institut für Biogeochemie, Jena
Dr. Bernard Heinesch	University of Liege, Liege
Prof. Dr. Astrid Kiendler-Scharr	Forschungszentrum Jülich GmbH, Jülich
Prof. Dr. Jos Lelieveld	Max-Planck-Institut für Chemie, Mainz
Prof. Dr. Oene Oenema	Wageningen University, Wageningen
Dipl.-Met. Marion Wichmann-Fiebig	Umweltbundesamt, Dessau-Roßlau
Dr. Wilfried Winiwarter	International Institute for Applied Systems Analysis, Laxenburg
Dr. Inge Wouters	Utrecht University, Untrecht

Programme Committee

Dipl.-Ing. Annette Borowiak	European Commission, JRC, Ispra
Prof. Dr. Hartmut Herrmann	Leibniz-Institut für Troposphärenforschung e.V., Leipzig
Dr. Elisabeth Hösen	Verein Deutscher Ingenieure e.V., Düsseldorf
Dipl.-Met. Marion Wichmann-Fiebig	Umweltbundesamt, Dessau-Roßlau
Prof. Dr. Peter Wiesen	Bergische Universität Wuppertal, Wuppertal
Prof. Dr. Dr. h.c. Reinhard Zellner	Universität Duisburg-Essen, Essen

The programme committee is supported by the GDCh working group "Atmospheric Chemistry" and the associated committees "Fine Particles" as well as "Chemistry, Air Quality, and Climate".

Poster Contributions

The poster session will provide an opportunity to complement the programme of the oral presentations in an informal setting. The number of poster contributions is limited. Therefore we kindly ask you to submit the provisional title of your poster presentation as soon as possible. You will receive a notification of acceptance or non-acceptance within reasonable time.

Programme

07/08 March 2018
DECHEMA e.V., Frankfurt (Main), Franz Patat Lecture Hall

	07 March 2018
11:00	**Welcome and introduction** N.N.
11:10	**Land-atmosphere exchange of trace gases from agriculture** David Fowler, Centre for Ecology & Hydrology
	Session 1: Emissions from agriculture, forestry and other land use Chairperson: Reinhard Zellner
11:40	**GHG emissions and agriculture in the tropics** Klaus Butterbach-Bahl, Karlsruher Institut für Technologie
12:10	**Climate protection in the agricultural sector** Heinz Flessa, Thünen-Institut für Agrarklimaschutz
12:40	**Land use change and global carbon cycles** Martin Heimann, Max-Planck-Institut für Biogeochemie
13:10	**Lunch**
	Session 2: Particulate matter: emissions – dispersion – ambient concentrations Chairperson: Marion Wichmann-Fiebig
14:15	**Agriculture and air quality** Jos Lelieveld, Max-Planck-Institut für Chemie
14:45	**Dispersion of bioaerosols** Inge Wouters, Untrecht University
15:15	**Bioaerosols from livestock farming** Marcus Clauß, Thünen-Institut für Agrartechnologie
15:45	**Coffee break**
	Session 3: The role of VOCs in atmosphere-biosphere interactions Chairperson: Hartmut Herrmann
16:00	**Emissions of volatile organic compounds from vegetation and the implications for atmospheric chemistry** Astrid Kiendler-Scharr, Forschungszentrum Jülich GmbH
16:30	**Insights into BVOC exchanges in three important temperate agricultural model systems (maize/wheat/grassland)** Bernard Heinesch, University of Liege
17:00	**Summary and discussion**
17:15	**Poster viewing and informal get-together**

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	08 March 2018
	Session 4: Reactive nitrogen in the atmosphere-biosphere-system Chairperson: Peter Wiesen
09:00	**Reactive nitrogen in relation to the key societal threats: air quality, water quality, soil quality, and terrestrial biodiversity** N.N.
09:30	**Deposition of reduced and oxidized nitrogen: Modeling, impact, emission reduction ceilings** Marion Wichmann-Fiebig, Umweltbundesamt
10:00	**Transformation of nitrogen compounds in the atmosphere** Jan Willem Erisman, Vrije Universiteit Amsterdam
10:30	**Integrating nitrogen fluxes at the European scale** N.N.
11:00	**Coffee break**
11:20	**Nitrogen in current European policies** Oene Oenema, Wageningen University
11:50	**Future scenarios of nitrogen in Europe** Wilfried Winiwarter, International Institute for Applied Systems Analysis
12:20	**Wrap-up and open discussion**
12:45	**End of VDI Expert Forum, Take-away snacks**

Registration

Please use the online registration at: **www.vdi.de/atmospheric-chemistry2018registration**
Early registration **(not later than 23 February 2018)** is recommended since the number of participants is limited.
Your registration will be confirmed as soon as possible. Your invoice will be sent separately.
The registration rates include lunch as well as coffee, tea and soft drinks during the breaks.

Category	**Registration rate**
Regular rate	275 €
Discounted rate (*)	195 €

* Discount applies for representatives of public authorities and universities.

Organization

Verein Deutscher Ingenieure e. V.
VDI/DIN-Kommission Reinhaltung der Luft (KRdL) – Normenausschuss
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General Information

Venue
DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V.
Franz Patat Lecture Hall
Theodor-Heuss-Allee 25
D-60486 FRANKFURT (MAIN)
http://dechema.de/en/anfahrt.html

Accomodation nearby
A number of single rooms has been provisionally booked at:

Mercure Hotel & Residenz Frankfurt Messe
Voltastrasse 29
D-60486 FRANKFURT (MAIN)
Phone: +49 (0) 69 79 26 2717
e-mail: h1204-re4@accor.com

The special rate is 99,51 € (breakfast excluded). Should you wish to make use of this offer please contact the hotel until **24 January 2018** indicating the **keyword "EFAC-4"**.

Travel Information

By car

Via Autobahn/Westkreuz to Frankfurt Stadtmitte, turn right at first traffic light after the railway bridge from the city centre in direction Messe (exhibition grounds), on Theodor-Heuss-Allee first left-hand turn-off lane before the railway bridge entrance Varrentrappstraße.

By public transport

From Frankfurt Airport:

- approx. 20 min. by taxi
- S-Bahn: S 8, S 9 (line 8 or 9) to the Main Station (Hauptbahnhof), change to S 3, S 4, S 5 or S 6 (platform 104, underground) to Station "Messe", exit Theodor-Heuss-Allee / Festhalle

From Frankfurt Main Station (Hauptbahnhof):

- approx. 20 min. walk
- approx. 10 min. by taxi
- S-Bahn: S 3, S 4, S 5 or S 6 (platform 104, underground) to Station "Messe", Exit Theodor-Heuss-Allee / Festhalle
- Underground: line U 4 (line 4) direction Bockenheimer Warte to Station "Messe", Exit "Festhalle" and 10 min. walk
- tram/streetcar line 16 or 17 to stop "Festhalle/Messe" and 10 min. walk