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Amine Emissions from Agricultural Sources

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In recent years there has been growing scientific interest in agricultural emissions of volatile organic compounds (VOCs) and their potential effects on air quality and the biogeochemical cycling of carbon and nitrogen. Among the many VOCs emitted, amines are particularly challenging to measure with currently available instruments.

In light of these analytical challenges, the Atmospheric Chemistry Group at the Department of Chemistry of the University of Oslo has developed a novel analytical instrument for the detection of atmospheric amines. The instrument is a modified version of a commercial Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (PTR-ToF-MS). After modification, this instrument has proven able to detect atmospheric amines down to single-digit-ppt levels. This instrument also benefits from a very short response time, which makes it possible to monitor rapid dynamic changes of amine concentrations in the atmosphere.

The novel instrument was deployed at the Livestock Production Research Centre (SHF) of the Norwegian University of Life Sciences (NMBU) in Ås (Norway) for characterizing agricultural emissions of VOCs in general, and of amines in particular.

Data analysis has so far revealed a very complex VOC emission pattern. Methylamine, trimethylamine and skatole were among the atmospheric amines detected in the ambient air in proximity of the facility. In addition to the field measurements, we also carried out laboratory experiments for analyzing VOCs in the dynamic headspace of different source materials (manure, animal feed, straw litter, etc.).

We will present the new instrument and preliminary data collected from this measurement campaign.