

Introduction and use of DAEMOS - Device for Ammonia Emission Measurements Of Soils



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Aims

- Building a device to efficiently measure very low concentrations of ammonia (NH_3) in the headspace of soil cores and litter samples
- Measurement of potential ammonia emissions of beech litter samples from two Austrian sites (SW+ OR)
- Follow NH_3 emissions of soil and litter samples over the course of litter decomposition

Material and Methods

A customized device was built at the Institute of Soil Research (BOKU) to hold soil samples (6 chambers) to conduct ammonia emission measurements of soils and litter on a very sensitive scale (parts per billion). NH_3 is measured with a Picarro G2103 $\text{NH}_3/\text{H}_2\text{O}$ CRDS analyzer. Components in touch with emissions consist of Teflon[®] and are heated to minimize ammonia depositions in the tubes. The newly built device was tested with reference gases and various samples to produce exact and reliable results.

Litter experiments

Beech-litter samples from two Austrian sites, OR (Ort, Gmunden, Upper Austria) and SW (Schottenwald, Vienna) were shredded and rewetted. The samples differed greatly in C:N ratios (OR 66,18 – SW 44,67). NH_3 emissions were measured over the course of 42h (see fig. 2).

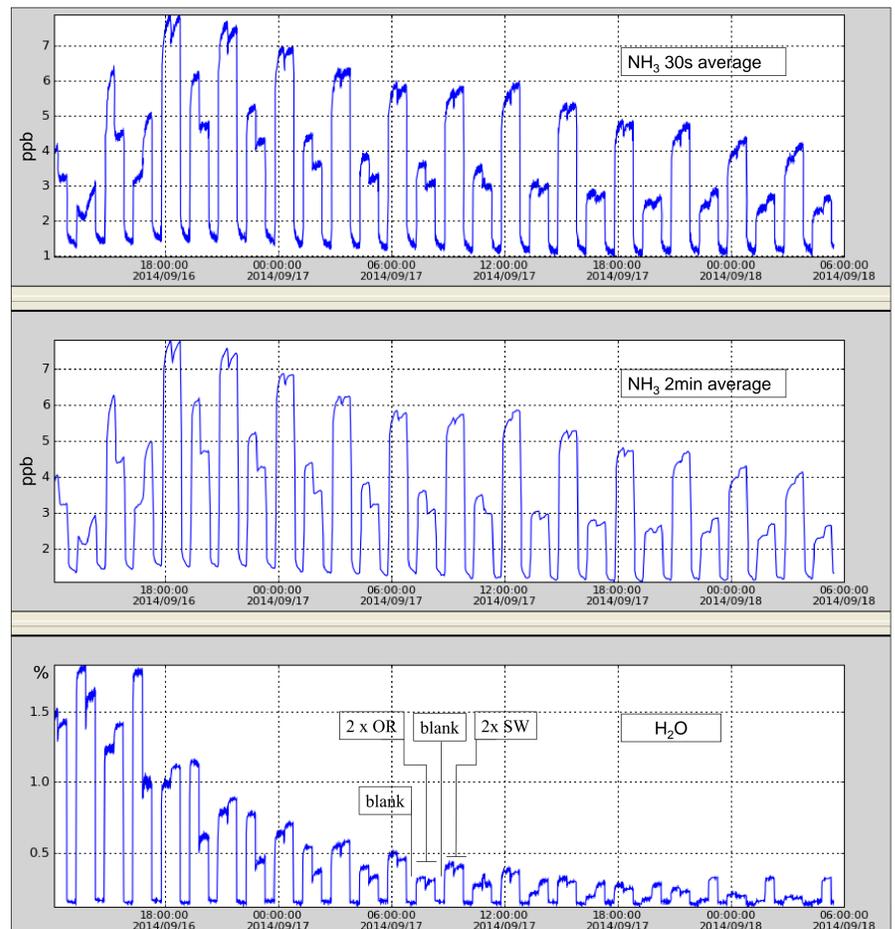


Figure 2: NH_3 and H_2O emissions of two beech litter samples over the course of 42h. Measurement program: blank-OR-OR-blank-SW-SW with 30min per sample chamber. No water was added over time.

Results

Figure 2 shows the emissions of beech litter samples from two sites. The replicates of the samples show very reliable results (close similarity of replicates, clear distinction between samples). The decline of the NH_3 emissions could be explained by the drying out of the litter samples and the “washing out” of initially present NH_3 on surfaces because of ammonia’s stickiness.

Outlook

- Keeping water concentrations of the samples constant over time.
- Following the NH_3 emissions in different states of decomposition with parallel CO_2 measurements and determination of other substances of the N cycle.
- Modelling the ammonia emission potential of the samples.

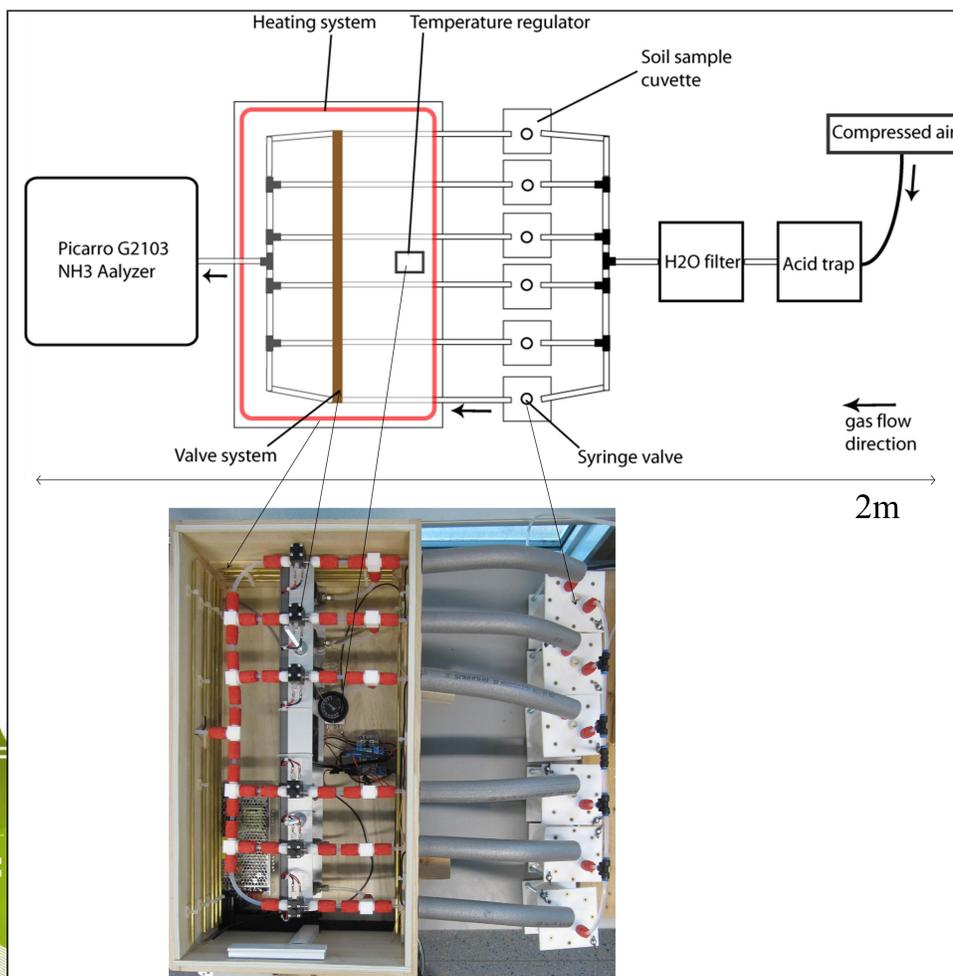


Figure 1: Daemos - Customized device to measure ammonia emissions of soil and litter samples. Sketch (shown above) and photo of valve chamber and the six sample holding chambers.