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NH₃ release through a forest canopy: an agro-forestry experiment

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The objective of this study is to assess the efficacy of farm woodlands for the recapture of agricultural ammonia emissions.

The NH₃ capture efficiency of a dense, closed canopy has been found to be very effective (see e.g. Nemitz et al., 2000). However, the efficiency of vegetation, as would typically be used in a silvo-pastoral system (where livestock range beneath a tree canopy), has not been quantified.

In this work, a release system was setup in a larch forest area in Southern Scotland, to simulate a chicken woodland farm. Concentrated CH₄ and NH₃ were released through the same grid of point sources located at the ground level of the under storey. The vertical concentration profiles were measured at the centre of the selected area, both within and just above the canopy. CH₄ was used as a tracer to assess the recapture ratios when compared to NH₃.

For these measurements a photo-acoustic NH₃ detector with a response time of 30 s and a detection limit of 100 ppt was used, alongside a tunable diode laser for fast CH₄ concentrations, together with an automatic profiler system, and a switching system that sequentially cycled through the series of vertical inlet positions.

In addition, vertical turbulence profiles (primarily of σ_w/u^*) were measured using a miniature ultrasonic anemometer with a reduced path length of 5 cm, to better resolve the turbulence structure within plant canopies.

The results are compared to a wind-tunnel test-study, and will be used to infer the ground level emission of ammonia and the amount recaptured by a tree canopy.

Nemitz E., Sutton M.A., Gut A., San José R., Husted S. and Schjørring J.K. , 2000: Sources and sinks of ammonia within an oilseed rape canopy. *Agric. Forest Meteorol.* **105**(4): 385-404.