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biogenic aerosol precursors: volatile amines from agriculture

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Information on the occurrence of volatile biogenic amines in the atmosphere is marginal. This group of N-bearing organic compounds are assumed to be a small, though significant component of the atmospheric N-cycle, but are not accounted for in global assessments due to the scarceness of available data. There is increasing evidence for an important role of biogenic amines in the formation of new particulate matter, as well as for aerosol secondary growth. Volatile amines are ubiquitously formed by biodegradation of organic matter, and agriculture is assumed to dominantly contribute to their atmospheric burden. Here we show that the mixing ratios of volatile amines within livestock buildings scale about 2 orders of magnitude lower than NH3, confirming the few literature data available (e.g. Schade and Crutzen, J. Atm. Chem. 22, 319-346, 1995). Flux measurements after manure application in the field, mixing ratios in the headspace of manure storage pools, and concentrations in distilled manure all indicate major depletion of amines relative to NH3 during manure processing. We conclude that the agricultural source distribution of NH3 and amines is not similar. While for NH3 the spreading of manure in the field dominates agricultural emissions, the direct release from livestock buildings dominates the budget of volatile biogenic amines.