

Dry Deposition of NH₃ in the Vicinity of a Swine Production Facility

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Abstract - Globally, domestic animals are the largest source (22 Tg N yr⁻¹, 1 Tg = 10¹² g) of atmospheric NH₃, comprising approximately 40% of natural and anthropogenic emissions combined, while synthetic fertilizers and agricultural crops together contribute an additional 12.6 Tg NH₃-N y⁻¹ (23% of total emissions). Within and downwind of mixed (animal and crop production) agricultural regions, NH₃ therefore plays a significant role in atmospheric chemistry, particularly the formation of inorganic PM_{2.5}, and deposition of nitrogen to terrestrial and aquatic systems. While animal production facilities have been identified as important sources of NH₃, there are no estimates of local NH₃ dry deposition for U.S. systems. This project investigates the dry deposition of NH₃ near a 5000 head swine production facility located in eastern North Carolina. Passive samplers are used to measure weekly-integrated NH₃ concentrations along horizontal gradients from the lagoon/housing complex out to a distance of 500 m. Dry deposition is estimated using a resistance model that accounts for vegetation and soil compensation points as well as cuticular and stomatal uptake. Preliminary results indicate dry deposition rates ranging from 200 kg NH₃-N ha⁻¹ yr⁻¹ within 25 m of the lagoon/housing complex to 5 kg NH₃-N ha⁻¹ yr⁻¹ at a distance of 500 m. During a 1-week period of concurrent emission and deposition measurements during October 2003, cumulative deposition (0.062 g NH₃ s⁻¹) over the 500 m radius accounted for approximately 8% of barn emissions (0.755 g NH₃ s⁻¹). Deposition measurements, which began during April 2003, will continue through April 2005 in order to capture the seasonal variability in emission rates, meteorology, and surface characteristics.

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