UNIVERSITY OF RHODE ISLAND
Department of Chemistry

SEMINAR

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URI

TOPIC

"Quantifying Dairy Farm Methane Emission via Tracer Gas Release"

HOST

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874-2377

Quantifying Dairy Farm Methane Emissions via Tracer Gas Release

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Above: An image I took of the one of the manure lagoon holding cells.

As an atmospheric compound, methane absorbs and scatters infrared light, making it a significant greenhouse gas. According to the EPA, enteric fermentation, the production of methane by ruminating animals, accounts for 22.5% of total methane emissions from anthropogenic activities, while manure management represents 8.4% in the U.S.[1] Questions explored in this talk will include: "How much methane does a dairy farm emit over the course of a day?" and "What is the biggest emitter of methane on the farm?" I will answer these questions by describing my experiences working as a summer intern for Aerodyne Research Inc. (Billerica, MA).

This past June, I joined Aerodyne's mobile laboratory team on a trip to southern and central California to measure methane emissions from two large scale dairy farms. The team uses infrared spectroscopy to measure methane at the part per billion level, up to 1 mile away from the source. The measurements are done by trace gas monitors inside a mobile laboratory, which is driven around the circumference of the farm. Using tracer gases, we were able to differentiate and quantify the major sources of methane on the dairy farms. With a known flow rate of the tracer, a flow rate can be calculated for methane emissions. Evaluating the correlation of the tracer and methane concentrations also allowed interfering sources to be identified and excluded from analysis.

Our data showed that the manure lagoons produced more methane than the livestock on both farms. More specifically, the middle stage of the drying process was the highest emitter, this being because it had a higher ratio of manure to water than the first stage without being completely dry. By determining the largest emission source on each farm, future remediation strategies can be more focused and cost-effective.

[1] "U.S. Greenhouse Gas Inventory Report: 1990-2014." *EPA*. Environmental Protection Agency, p. 317. 15 Apr. 2016.