M.S. Defense Announcement
En Li
September 5, 2023, at 10:00 a.m.

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M.S. Defense

Tuesday, September 5, 2023
10:00 a.m.

Defense
ATS Large Classroom (101 ATS) or Teams

Post Defense Meeting
ATS Main Conference Room (209 ATS)

Committee:
Jeffrey Pierce (Advisor)
Emily Fischer (Co-advisor)
Amy Sullivan
Shantanu Jathar (Mechanical Engineering)

Inorganic Gas-Aerosol Partitioning in and around Animal Feeding Operation Plumes in Northeastern Colorado in Late Summer 2021

Ammonia (NH3) from animal feeding operations (AFOs) is an increasingly important source of reactive nitrogen in the US, but despite its ramifications to air quality and human and ecosystem health, its near-source evolution remains understudied. To this end, the Transport and Transformation of Ammonia (TRANS2Am) field campaign was conducted in the northeastern Colorado Front Range in summer 2021 and characterized atmospheric composition downwind of AFOs during 10 research flights under varying meteorological conditions. Airborne measurements of NH3, nitric acid (HNO3), and a suite of water-soluble aerosol species collected onboard the University of Wyoming King Air (UWKA) research aircraft present a unique opportunity to investigate (1) the sensitivity of particulate matter (PM) formation to AFO emissions, and (2) the seasonality of NH4NO3 formation in northeastern CO. We find that the study region is consistently in the NH3-rich and HNO3-limited NH4NO3 formation regime. Further investigation using the Extended Aerosol Inorganics Model (E-AIM) reveals that hot summertime temperatures (mean: 23 ˚C) of northeastern Colorado, especially near the surface, inhibit NH4NO3 formation despite high (max: 114 ppbv) NH3 concentrations. Lastly, we model spring/autumn and winter conditions in E-AIM to explore the seasonality of NH4NO3 formation in this region and find that the cooler temperatures could support substantially more NH4NO3 formation. Whereas summertime NH4NO3 only exceeds 1 µg m-3 ~10% of the time in the observations and corresponding simulations, and modeled NH4NO3 would exceed 1 µg m-3 61% of the time in spring/autumn, with a 10˚C temperature decrease, and 88% of the time in winter, with a 20˚C temperature decrease.