Ph.D. Defense Announcement
Zitely Tzompa
October 23, 2018 at 1:00pm

Zitely Tzompa
Ph.D. Defense

Tuesday, October 23, 2018
1:00pm

Defense
ATS West Seminar Room (121 ATSW)

Post Defense Meeting
Riehl Conference Room (211 ACRC)

Committee:
Emily Fischer (advisor)
Sonia Kreidenweis
Jeffrey Pierce
Shantanu Jathar (Mechanical Engineering) substituting for Delphine Farmer (Chemistry)

Atmospheric and air quality implications of C_2-C_5 alkane emissions from the oil and gas sector

Oil and gas extraction has undergone a dramatic increase over the past century and, more recently, the advent of hydraulic fracturing has opened up new regions to extraction, particularly in the United States. This oil and gas extraction, and associated infrastructure, emit a variety of compounds including light alkanes (C2-C5) that have been shown to contribute to air quality degradation. Further, there is an observed ubiquitous increase in the atmospheric abundance of light alkanes in the Northern Hemisphere. Given this, it is critically important that we develop methodologies to estimate light alkane emissions with a rapidly evolving oil and gas industry. This is currently a challenge for emission inventories. I will present results from three recent papers that quantify the role of the oil and gas sector on light alkane emissions at local, regional, and global scales. Results from a global budget of ethane (C2H6) suggest that emissions of light alkanes in several major anthropogenic source regions, including the central and eastern U.S., Europe, Russia, and the Middle East, should be revisited. A closer look into the U.S. with updated oil and gas emissions was done using a nested high-resolution (0.5 degree x 0.667 degree) simulation to examine the contribution of this sector to the abundance of C2-C5 alkanes. The model simulation largely reproduces observed C2 and C4-C5 alkane abundances over the U.S., based on a comparison to a large suite of surface observations, column measurements, and aircraft profiles. In contrast, simulated propane (C3H8) abundances over the central U.S. are low compared to observations, suggesting that emissions from this sector need to be revisited. Findings also point that emissions of C2-C5 alkanes from the oil and gas sector make the largest contribution to secondary species production (e.g., ozone, peroxyacetyl nitrate, and several ketones) over the central U.S. compared to other regions.