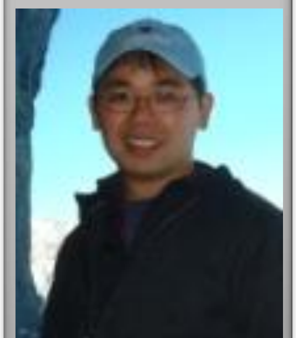

INVESTIGATING METHANE EMISSIONS IN THE SALT LAKE VALLEY: AN ATMOSPHERIC INVERSE STUDY

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Due to the growing popularity of natural gas as an alternative fuel, methane (CH_4) emissions are expected to increase in and around Salt Lake City, Utah. Incomplete combustion and leaks in natural gas systems can lead to unintended emissions of CH_4. Since CH_4 is both a significantly stronger greenhouse gas than carbon dioxide and a precursor to the formation of ozone, fugitive emissions of CH_4 have the potential to offset or worsen gains made by transitioning from traditional fossil fuel sources. With such a large and growing natural gas infrastructure in an urban area like the Salt Lake Valley, monitoring and mitigating CH_4 emissions is a big challenge. This study implemented inverse analysis to estimate CH_4 emissions in the Salt Lake Valley. The Weather Research and Forecasting (WRF) model was coupled with the Stochastic Time-Inverted Lagrangian Transport (STILT) model to generate footprints describing the sensitivity of measurements to upwind emissions. These footprints were used with rooftop CH_4 measurements from the Earth Networks Greenhouse Gas System at the University of Utah to solve for CH_4 flux in the Salt Lake Valley. Large scale inversions have difficulty producing accurate results in areas with complex terrain. This study provides information on a small scale which can be compared with large scale inversions. These comparisons may provide insight on how to overcome challenges that arise from complex terrain and urban areas. We conclude that because small scale inversions are so sensitive to input parameters, a high level of expertise of the local characteristics is required for each inversion location.