Geophysical Research Abstracts
Vol. 21, EGU2019-12518, 2019
EGU General Assembly 2019

Tiered Methane Monitoring System for California

Riley Duren (1), Andrew Thorpe (1), Vineet Yadav (1), Kelsey Foster (1), Robert Tapella (1), Brian Bue (1), Daniel Cusworth (1), Kristal Verhulst (1), Stanley Sander (1), Charles Miller (1), Francesca Hopkins (2), and Talha Rafiq (2)

(1) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, United States , (2) University of California - Riverside, Riverside, United States

Methane mitigation has emerged as a high priority for many sub-national entities ranging from state and provincial governments to cities and individual facility operators. Recent years have seen dramatic improvements in the ability of atmospheric spectroscopy to detect and locate anthropogenic methane emission sources with spatial and sectoral resolution sufficient to understand the controlling processes. Multiple studies have provided compelling evidence of a long-tail distribution of emission sources - indicating the methane footprints of many sectors and regions are often dominated by a relatively small number of super-emitters, frequently with >50% of the emissions originating from <10% of the relevant infrastructure. Focusing attention on methane super-emitters and other strong point sources promises to be an efficient way to mitigate methane— particularly if anomalous operation of individual pieces of equipment can be identified to operators and other stakeholders in a timely fashion. However, operational implementation of point source monitoring and detection is complicated by the fact that many sources are often intermittent and/or appear unpredictably across large areas. Additionally, there also remain large uncertainties in area sources of methane in the agricultural and waste management sectors and/or large numbers of very small leaks (e.g., in the downstream natural gas system) that are often not well represented by current methane inventories. This highlights the need for persistent observations of atmospheric methane over large areas that are both spatially and temporally complete and with sufficient resolution to provide actionable mitigation guidance. This suggests a need to deploy and integrated a "tiered" system of observations and analysis methods able to operate across many space-time scales and sectors.

We are testing a prototype methane monitoring system in California that combines atmospheric methane observations from multiple techniques and vantage points, geospatially resolved infrastructure data, machine learning, flux analysis, and a data fusion framework and data portal to assess and communicate methane emissions at scales ranging from statewide to large cities to individual infrastructure elements. Observational tiers include satellite observations spanning the state of California, periodic statewide airborne remote sensing surveys of point sources, and a regional network of tower-base in situ sensors and a geostationary satellite testbed overlooking the Los Angeles megacity. This effort is intended to improve the relevance of methane observations by developing and validating point source flux estimates with uncertainties, linking that information with multi-scale attribution data and regional flux estimates, and coordinating with representative stakeholders in California to infuse those products into their decision-making frameworks. This pilot is being conducted with inputs and participation from California Air Resources Board, the California Energy Commission, local air quality management agencies, private sector companies, and individual facility operators. In this talk we will describe the relevant observations, analysis framework, and key findings including examples of data sharing and successful mitigation of anomalous methane emissions in multiple sectors. We will also describe potential future advances including expansion to other key regions globally.