

6.115 Characterization of the northern Colorado front range tropospheric C₂H₆, CH₄, HCHO, NH₃, O₃, and CO from ground based high spectral resolution FTIR measurements: oil & natural gas signature.

Early Career Scientist

Presenting Author:

Ivan Ortega, National Center for Atmospheric Research, Boulder, CO, USA,
iortega@ucar.edu

Co-Authors:

Rebecca Buchholz, National Center for Atmospheric Research, Boulder, CO, USA
James Hannigan, National Center for Atmospheric Research, Boulder, CO, USA

Abstract:

Over the past several years oil and natural gas (O&NG) related activities have increased tremendously in the northern Colorado Front Range. Fugitive emissions of gases from these activities impact air quality locally and have the potential to impact global air quality and climate. Consequently, extensive measurements of emitted atmospheric pollutants associated with O&NG activities have increased. However, the evolution and spatial distribution of multiple chemical species have mainly been characterized in limited field campaigns, i.e., FRAPPE and DISCOVER-AQ. In addition, recent studies show global reach of these emissions (e.g. Franco et al., 2016). In this work, we present long-term simultaneous measurements of tropospheric C₂H₆, CH₄, HCHO, NH₃, O₃, and CO obtained from ground-based high spectral resolution solar absorption measurements in Boulder, Colorado from 2010 to present. The multi-year observations are used to identify the season to season changes in each species and distinguish short-term peak enhancements of C₂H₆ and CH₄, likely caused by local O&NG point sources and NH₃ from cattle feedlots. Our measurements, which are not influenced by the evolution of the planetary boundary layer, provide independent information to evaluate bottom-up emission inventories, as well as validate current and future satellite measurements, e.g., TEMPO.

Franco, B., E Mahieu, L K Emmons, Z A Tzompa-Sosa, E V Fischer, K Sudo, B Bovy, S Conway, D Griffin, J W Hannigan, K Strong, K A Walker, *Evaluating ethane and methane emissions associated with the development of oil and natural gas extraction in North America*, in press, Nov 2015, Environment Research Letters