

3.018 Methane attribution in a U.S. onshore dry gas basin using ground and airborne measured C₂H₆/CH₄ enhancement ratios.

Early Career Scientist

Presenting Author:

Ingrid Mielke-Maday, University of Colorado Boulder/NOAA/CIRES, Boulder, Colorado, USA, ingrid.mielke-maday@noaa.gov

Co-Authors:

Stefan Schwietzke, NOAA/CIRES

Eryka Thorley, CIRES

Tara Yacoyitch, Aerodyne Research, Inc.

Steve Conley, University of California-Davis

Jonathan Kofler, NOAA/CIRES

Philip Handley, NOAA

Ben Miller, NOAA/CIRES

Brad Hall, NOAA

Ed Dlugokencky, NOAA

Pat Lang, NOAA

Sonja Wolter, NOAA/CIRES

Eric Moglia, NOAA/CIRES

Molly Crotnell, NOAA/CIRES

Russ Schnell, NOAA

Gabrielle Pétron, NOAA/CIRES

Abstract:

Here we present results that will be used to perform a methane (CH_4) source attribution in a dry gas-producing basin in the United States in order to estimate the contribution from natural gas operations to the total methane in that basin. Methane enhancements were documented and ethane to methane enhancement signatures ($\text{C}_2\text{H}_6/\text{CH}_4$) were compiled in CH_4 plumes in a portion of the Fayetteville Shale in northern Arkansas using a quantum cascade tunable infrared laser direct absorption spectrometer (QCTILDAS) (Aerodyne Research, Inc.) aboard a mobile laboratory. The $\text{C}_2\text{H}_6/\text{CH}_4$ enhancement ratio (ER) can be used to differentiate between fossil fuel and microbial CH_4 sources because C_2H_6 is not co-emitted with CH_4 from microbial sources. $\text{C}_2\text{H}_6/\text{CH}_4$ ERs from natural gas sources obtained with in situ measurements show good agreement with ratios calculated using discrete flask samples collected in the same facility plumes. Repeatability in the $\text{C}_2\text{H}_6/\text{CH}_4$ ER at several natural gas facilities across multiple days suggests that an ER measured at a facility on any given day is representative of routine emissions. $\text{C}_2\text{H}_6/\text{CH}_4$ ERs from natural gas facilities display spatial variability throughout the study area, with the eastern region containing a relatively high number of facilities with large $\text{C}_2\text{H}_6/\text{CH}_4$ ERs, which underscores the need to take spatial variability in natural gas composition into account when performing a methane attribution.