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

Early Career Scientist

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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 (C$_2$H$_6$/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 (QC-TILDAS) (Aerodyne Research, Inc.) aboard a mobile laboratory. The C$_2$H$_6$/CH$_4$ enhancement ratio (ER) can be used to differentiate between fossil fuel and microbial CH$_4$ sources because C$_2$H$_6$ is not co-emitted with CH$_4$ from microbial sources. C$_2$H$_6$/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 C$_2$H$_6$/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. C$_2$H$_6$/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 C$_2$H$_6$/CH$_4$ ERs, which underscores the need to take spatial variability in natural gas composition into account when performing a methane attribution.