Geophysical Research Abstracts
Vol. 21, EGU2019-12509, 2019
EGU General Assembly 2019

Improved open path FTIR detection of fugitive CO_2, CH4 and other trace gases in the atmosphere

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Open path spectroscopic monitoring of atmospheric trace gases provides a means to detect and quantify fugitive sources of trace gases in the atmosphere, such as from coal seam or shale gas extraction of CH4 or sequestration of CO_2 in carbon capture and storage. Open path techniques complement in situ measurements at a point by probing an extended region of the atmosphere. Measurements of enhanced concentrations of fugitive gases can be combined with small to regional scale meteorological modelling to invert concentration measurements into flux estimates. In previous work presented at this meeting in 2015 and subsequently published (1) we demonstrated an open path monitoring system based on FTIR spectroscopy in the near infrared (NIR) over a pathlength of 1.5 km in an urban environment, the city of Heidelberg, Germany. In this work we describe a development of optical system for open path FTIR spectroscopy in the NIR which leads to significantly improved light throughput and detection limits for atmospheric trace gases. In this paper we will present the current performance characteristics of the open path FTIR system from field campaigns and provide estimates of the magnitude of fugitive fluxes that may be determined.

1. Griffith, D. W. T., Pöhler, D., Schmitt, S., Hammer, S., Vardag, S. N., and Platt, U.: Long open-path measurements of greenhouse gases in air using near-infrared Fourier transform spectroscopy, Atmos. Meas. Tech., 11, 1549-1563, 10.5194/amt-11-1549-2018, 2018.