METHANE DETECTION FOR OIL AND GAS PRODUCTION SITES USING PORTABLE DUAL-COMB SPECTROMETRY

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Considerable uncertainty exists regarding the contribution of oil and gas operations to anthropogenic emissions of atmospheric methane. Additionally, new proposed EPA regulations on volatile organic compound (VOC) emissions from oil and gas production facilities have been expanded to include methane, making this a topic of growing importance to the oil and gas industry as well as regulators. In order to gain a better understanding of emissions, reliable techniques that enable long-term monitoring of entire production facilities are needed. Recent advances in the development of compact and robust fiber frequency combs are enabling the use of this powerful spectroscopic tool outside of the laboratory. Here we characterize and demonstrate a dual comb spectrometer (DCS) system with the potential to locate and size methane leaks from oil and gas production sites over extended periods of time. The DCS operates over kilometer scale open paths, and the path integrated methane measurements will ultimately be coupled with an atmospheric inversion utilizing local meteorology and a high resolution fluid dynamics simulation to determine leak location and also derive a leak rate. High instrument precision is needed in order to accurately perform the measurement inversion on the highly varying methane background, thus the DCS system has been fully optimized for the detection of atmospheric methane in the methane absorption region around 180-184 THz.