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Natural Gas Pipeline Leaks Across Washington, DC

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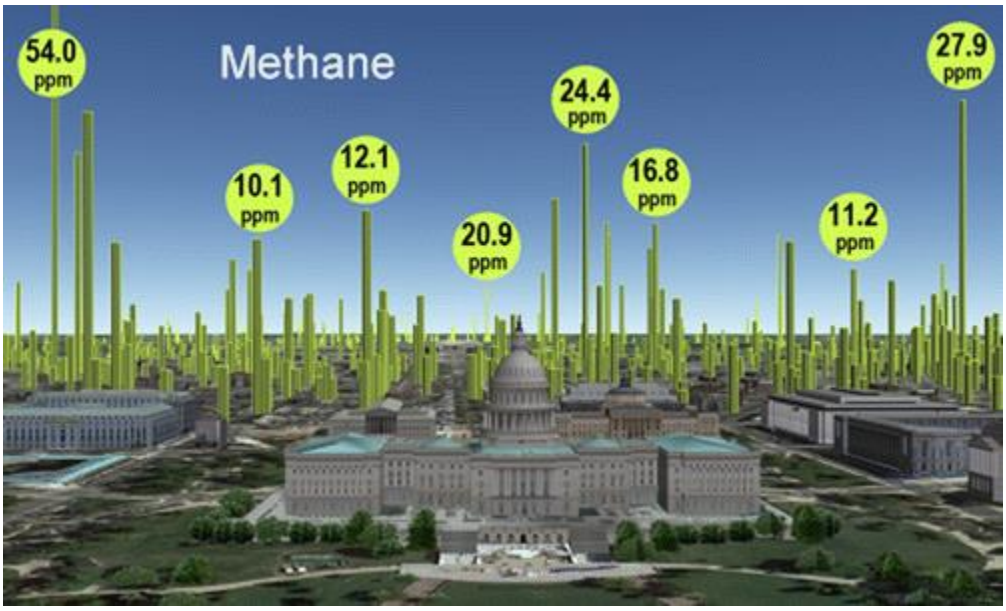
Abstract



Pipeline safety in the United States has increased in recent decades, but incidents involving natural gas pipelines still cause an average of 17 fatalities and $133 M in property damage annually. Natural gas leaks are also the largest anthropogenic source of the greenhouse gas

methane (CH_4) in the U.S. To reduce pipeline leakage and increase consumer safety, we deployed a Picarro G2301 Cavity Ring-Down Spectrometer in a car, mapping 5893 natural gas leaks (2.5 to 88.6 ppm CH_4) across 1500 road miles of Washington, DC. The $\delta^{13}C$-isotopic signatures of the methane (−38.2‰ ± 3.9‰ s.d.) and ethane (−36.5 ± 1.1 s.d.) and the CH_4:C_2H_6 ratios (25.5 ± 8.9 s.d.) closely matched the pipeline gas (−39.0‰ and −36.2‰ for methane and ethane; 19.0 for CH_4/C_2H_6). Emissions from four street leaks ranged from 9200 to 38 200 L CH_4 day^{-1} each, comparable to natural gas used by 1.7 to 7.0 homes, respectively. At 19 tested locations, 12 potentially explosive (Grade 1) methane concentrations of 50 000 to 500 000 ppm were detected in manholes. Financial incentives and targeted programs among companies, public utility commissions, and scientists to reduce leaks and replace old cast-iron pipes will improve consumer safety and air quality, save money, and lower greenhouse gas emissions.