High-resolution Mobile Measurements of Methane Concentrations and Fluxes Using High-Speed Open-Path Technology on Cars, Ships, Airplanes, Helicopters and Drones

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The major sources of methane include agricultural and natural production, landfill emissions, oil and gas development sites, and natural gas distribution networks in rural and urban environments. The majority of agricultural and natural methane production occurs in areas with little infrastructure or easily available grid power (e.g., rice fields, arctic and boreal wetlands, tropical mangroves, etc.). The majority of oil and gas and urban methane emission occurs via variable-rate point sources or diffused spots in topographically challenging terrains (e.g., street tunnels, elevated locations at water treatment plants, vents, etc.). Landfill methane emissions traditionally assessed at monthly or longer time intervals are subject to large uncertainties because of the snapshot nature of the measurements and the barometric pumping phenomenon. Locating and measuring such methane emissions is challenging when using traditional micrometeorological techniques, and requires development of novel approaches.

A lightweight, high-speed, high-resolution, open-path technology was recently developed for eddy covariance measurements of methane flux, with power consumption 30-150 times below other available technologies [1, 2]. It was designed to run on solar panels and be placed in the middle of the methane-producing ecosystem without a need for grid power [1].

Lately, this instrumentation has been utilized increasingly more frequently outside of the traditional use on stationary flux towers [3]. These novel approaches include measurements from various moving platforms, such as cars, aircraft, and ships. Projects included mapping of concentrations and vertical profiles, leak detection and quantification, mobile emission detection from natural gas-powered cars, soil methane flux surveys, etc.

This presentation will describe the latest state of the key projects utilizing the novel lightweight low-power high-resolution open-path technology, and will highlight several novel approaches where such instrumentation was used in mobile deployments in urban, agricultural and natural environments by academic institutions, regulatory agencies and industry.

References:

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