A41N-1773 Top-Down Constraints on Natural Gas Distribution Network Fugitive Emissions in the Portland (OR, USA) Metropolitan Area by In-situ Measurements of Greenhouse Gases and Non-Methane Hydrocarbons

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08:30 - 12:20

Hall B-C (Poster Hall) (Convention Center)

Abstract

Methane (CH_4) and non-methane hydrocarbon (NMHC) concentrations were measured in ambient air in Portland, Oregon (USA) to quantify the contribution of CH_4 emissions from the local gas distribution network during the summer of 2024. Portland provides a useful sampling site for evaluating urban greenhouse gas (GHG) emissions in the center of a mid-sized metropolitan area, including five cities with a combined population of 2.5 million, where fugitive natural gas emissions are primarily attributed to distribution and end-use activities. A suite of in-situ automated analytical instruments was developed to obtain hourly averages of CH_4, NMHC, carbon dioxide (CO_2), and nitrous oxide (N_2O). The instruments were deployed in downtown Portland (45.513N, 122.686W, 63m). The NMHC system is configured for dual use, capable of switching between measuring ambient air samples via an adsorbent trap and micro-volume injections of natural gas samples. Measured concentrations of ethane, propane, and i/n-butane are reported, and hydrocarbon ratios are calculated. Ambient NMHC ratios are compared with natural gas samples collected directly from the Northwest Natural distribution network throughout the summer. Whole air samples were also collected from an upwind station in the Columbia River Gorge (45.720N, 122.817W) to compare background concentrations unaffected by urban emissions. Air parcel back-trajectories, obtained using the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model, were used to identify the influence of regional wildfires and nearby agriculture on measured concentrations

and hydrocarbon ratios. The results presented include a time series of ambient GHGs and NMHC concentrations for summer 2024, ambient hydrocarbon ratios and their relation to natural gas source ratios, and an assessment of other important regional GHG ambient concentration observations.

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