Sources and Variability of Air Toxics Downwind of an Oil and Natural Gas-producing Well Pad in a Residential Community

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As population growth in the Colorado Front Range continues, local oil and natural gas (O&NG) production operations and communities are becoming closer in proximity, raising concern about potential exposure of residents to air pollutants from these operations. Operators can now drill over 20 wells from one pad and horizontally for two to three miles. These large multi-well pads are industrial sites that are rapidly transforming the northeastern Colorado rural and suburban landscape. Of particular concern is benzene, a carcinogen linked to leukemia that can be released from a number of O&NG sources. Here we present results from five weeks of continuous, calibrated *in situ* measurements at a residence downwind of a new 22-well oil and gas-producing pad in Greeley, CO with a focus on benzene, toluene, ethylbenzene and xylene (BTEX) and O&NG and combustion markers. The day-to-day and diurnal variability of ambient trace gas mixing ratios downwind of the well pad is presented and the role of meteorology in the observed variability evaluated. An analysis using O&NG and combustion tracers and wind data is used to identify different emission sources (well pad, nearby road traffic) and their contributions to the observed variability. This work is funded by the National Science Foundation AirWaterGas (AWG) Sustainability Research Network and is a collaboration with the Colorado School of Public Health.

Figure 1. The mobile laboratory, an instrumented van, was parked at a residence ~260 m downwind of a well pad.

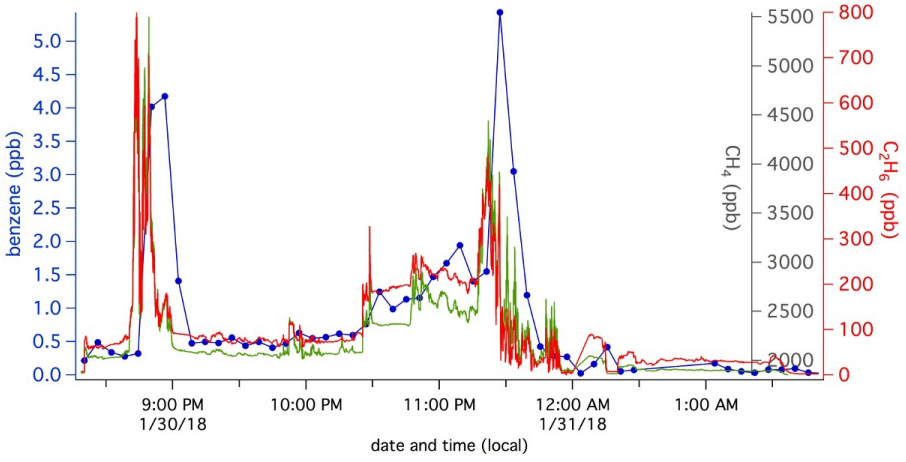

Figure 2. This period of elevated benzene is likely due to emissions from the well pad, indicated by elevated and correlated methane (CH_4) and ethane (C_2H_6).