**Title:**

Composition of organic compound emissions from oil and gas wells

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**Abstract:**

We measured the composition of organic compounds emitted in raw gas and flash gas from oil and gas wells in the Uinta Basin. Raw gas is natural gas that has not yet been purified for sales, and flash gas is gas emitted from hydrocarbon liquids when the liquids are depressurized and/or heated. Flash gas is emitted primarily from liquid storage tanks, and raw gas is emitted primarily from valve and fitting leaks and pneumatic devices. We used two different methods: (1) we collected and analyzed raw gas samples and pressurized liquid samples (for flash gas analysis) from oil/gas/water separators at well pads, and (2) we directly measured raw and flash gas emissions using a custom-built high-flow system.

Total organic compound emissionss from liquid storage tanks (oil and water) were much higher, on average, than emissions from other equipment and leaks at well pads. Methane and light alkanes dominated emissions from raw gas sources, while C4-C8 alkanes (i.e., alkanes with between 4 and 8 carbon atoms) dominated flash gas emissions. Emissions of carbonyls, alkenes, and alcohols from these sources were almost always measureable, but they were always very low. The vast majority of the ability of these emissions to react in the atmosphere and form ozone comes from non-methane alkanes and aromatics. This is because these compounds groups were abundant in emissions and because they have relatively high reactivity (i.e., high ability to produce ozone). We found that, while raw gas emissions measured by the two methods used were statistically similar, flash gas emissions measured with our high flow system tended to be richer in C7-C8 alkanes and aromatics than emissions determined from separator samples.

We processed this emissions composition information into “speciation profiles”, which are used to allocate and speciate emissions in photochemical models, and the next phase of this work is to determine how the updated profiles impact photochemical model performance.