**Comparison of Observed BTEX Emission Flux Estimates from Oil and Natural Gas Production Well Pads to Inventory-derived Estimates in the Uintah Basin**

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Advancements in unconventional oil and natural gas (O&NG) extraction techniques have dramatically increased O&NG production in the U.S. over the last decade, increasing the need to accurately estimate emissions from this sector. Previous studies have shown that emission inventories for the O&NG production sector have consistently underestimated both methane and volatile organic compound (VOC) emissions despite efforts to update and modify these inventories in recent years. Utah’s Uintah Basin became an area of interest after a study by Karion et al. (2013) reported basin-wide methane emissions of 6 – 12% of production, significantly higher than rates derived from national-scale inventories of ~ 1%. In addition to methane, O&NG production in the Uintah Basin emits large quantities of VOCs that have contributed to numerous severe wintertime ozone episodes in recent years. An underestimation of VOCs in emission inventories can result in poor performance of atmospheric models attempting to reproduce ozone production. Of particular interest to this study are the aromatic compounds benzene, toluene, ethylbenzene and xylenes (BTEX), which are air toxics and ozone precursors.

The University of Wyoming Mobile Laboratory, equipped with an Ionicon PTR-TOF-MS to measure BTEX, made direct measurements of emissions from O&NG well pads in the Uintah Basin. The EPA Other Test Method (OTM) 33A was used to quantify atmospheric emission fluxes of BTEX from 32 well pads. Fluxes are determined in OTM 33A via rapid wind and concentration measurements that are used to model a source’s average emissions as a Gaussian plume. For this study, facility-level BTEX fluxes are compared to a regional O&NG emission inventory developed specifically for the Uintah Basin, and are also scaled up to compare to the National Emission Inventory (NEI), allowing for comparisons at both the facility- and county-level. Results show that, similar to methane emissions, actual BTEX emissions are also greatly underestimated by emission inventories in the Uintah Basin. Furthermore, the inventories show greater underestimations for heavier hydrocarbons, suggesting an error in the gas speciation profiles used to estimate emissions, which would have important consequences for air quality modelling in the basin.

