Using Methane Observations to derive Top-down Estimates of VOC and NOx Emissions from Oil and Gas Production in the Uinta Basin

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Methane (CH_4), NOx, and Volatile Organic Compounds (VOCs) are emitted as part of oil and gas production. In-situ CH_4 observations have been carried out at ground sites in the Uinta Basin since 2015 and have already been used in a previous study to derive multi-year trends in CH_4 emissions, using a top-down method. Here we make use of the long-term observations of CH_4 in the Uinta Basin, coupled with VOC and NOx observations, to scale up VOC and NOx emissions to the Basin level. We first show correlations and the regression slopes between CH_4 and VOC/NOx. Combining these slopes with the top-down CH_4 emissions, we derive estimates of VOC and NOx emissions from oil and gas production in the Uinta Basin. These emissions are compared against values reported from a regulatory bottom-up inventory.

We find emissions of NOx in the 2017 regulatory emissions inventory to be 4.4 times higher than emissions derived from the regression slope with CH_4 (using 2017 regression data). VOC emissions were 41% lower in the regulatory inventory, however. This finding that NOx emissions are too high in regulatory oil and gas emissions inventories, and that VOC emissions are too low, is consistent with several previous studies.