

## Top-down Constraint on Hydrocarbon Emissions in the Denver-Julesburg Oil and Natural Gas Basin

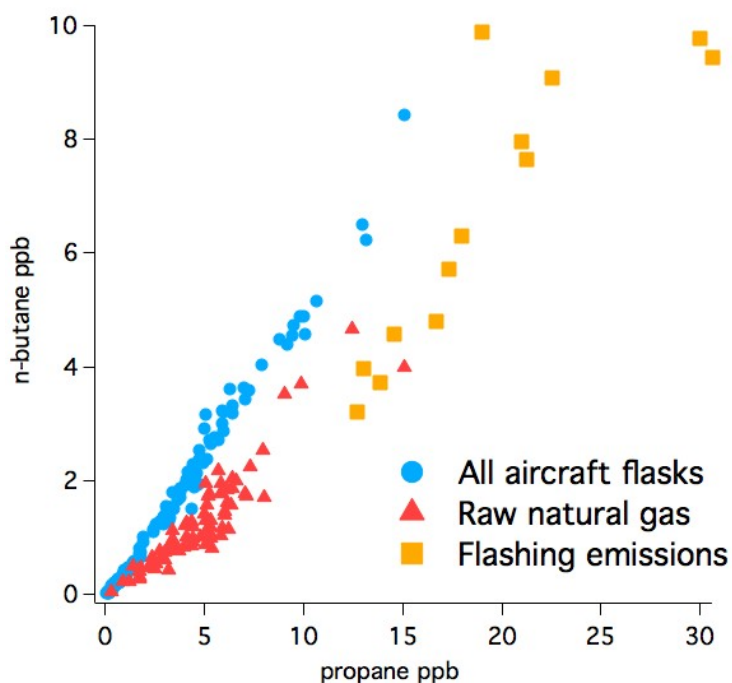
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NOAA Earth System Research Laboratory conducted an intensive measurement campaign in Colorado's NE Front Range in May 2012 to investigate hydrocarbon emissions from oil and gas operations. The study region was centered on the most densely drilled region (> 24,000 active wells) of the Denver-Julesburg Basin. Total methane (CH<sub>4</sub>) emissions for the region were estimated using a mass-balance approach with *in situ* CH<sub>4</sub> data from flights conducted on two different days and ground-based measurements of wind direction and speed. CH<sub>4</sub> and over 40 different species were also analyzed in a total of 118 discrete air samples collected by the airplane on 12 flights. Here we present data for CH<sub>4</sub>, propane, n-butane, i-pentane, n-pentane, benzene, acetylene and carbon monoxide. Top-down emission estimates were calculated for the non-methane hydrocarbon measured based on the total CH<sub>4</sub> emission top-down estimate and hydrocarbon correlation slopes for the airborne discrete air samples. The aircraft data are compared with the NOAA Global Monitoring Division long-term measurements of air samples collected since 2007 at the Boulder Atmospheric Observatory tower, north of Denver. We also compare the atmospheric measurements with raw natural gas and flashing tower emissions from oil tanks composition data provided by the Colorado Oil and Gas Conservation Commission (COGCC) and the Colorado Department of Public Health and the Environment (CDPHE).



**Figure 1.** n-butane versus propane in aircraft samples collected in the Denver-Julesburg Basin in May 2012 (blue circles) and in composition profiles for natural gas produced in the region (source: COGCC, red triangles) and for flashing emissions from oil and liquid condensate storage tanks (source: CDPHE, yellow squares).