

Highlights: Four Corners Methane Emissions Verification Study

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During the month of April 2015 a NASA and NOAA aircraft and ground campaign focused on the verification and attribution of a recent study by Kort et al. (2014) that found 0.6 Tg/yr of methane (10% of the EPA's total natural gas based GHG emissions) was being emitted from the San Juan Basin. This region is home to the Fruitland Coal Formation which not only provides fuel for the largest power plants in the southwestern U.S. Four Corners region but also is the largest source of coalbed methane production in the U.S.. Below the Fruitland Formation are several other geological formations that provide both natural gas and oil. Coal, oil and gas operations are likely to be sources of methane emissions. While there are few other sources of methane such as agriculture, wetlands and waste management, this area is likely to have significant sources in areas where the Fruitland Formation outcrops.

This coordinated field campaign used a tiered approach to investigate methane emissions in the San Juan Basin. At the basin-scale a simple mass balance technique was used to quantify methane and ethane emissions over the 80 km x 100 km region. To subdivide the larger region, multiple aircraft equipped with *in situ* methane sensors and a variety of other *in situ* measurements including ethane used a raster pattern to map the basin according to tracer/tracer enhancement ratios. These raster patterns also enable identification of large point sources which were further investigated using two Twin Otters each carrying two NASA hyperspectral remote sensing instruments: HyTES and AVIRIS-ng. Emissions from the large point sources were then quantified using a facility-level mass-balance approach. Fingerprints of emissions ratios of hydrocarbon and carbon-13/carbon-12 isotopes of methane were measured at different sites by two ground-based vehicles to better understand the potential impact of individual large and small emitters to the basin scale methane and non-methane hydrocarbon emissions.

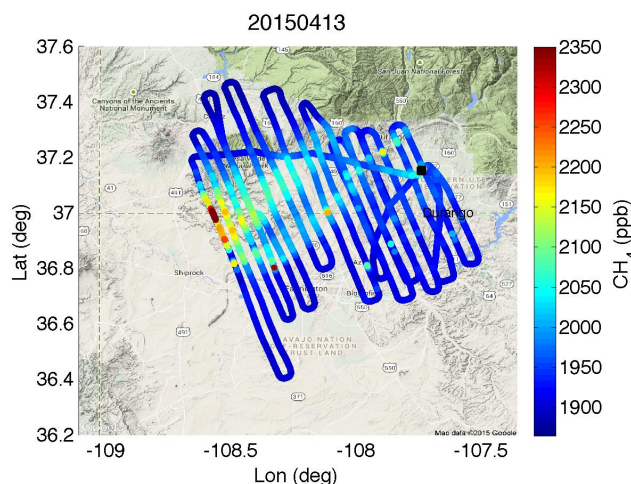


Figure 1. Sample raster pattern showing overall CH₄ distribution and smaller point source emissions points in the San Juan Basin.



Figure 2. NASA, NOAA and University of Colorado aircraft and vans used in the San Juan Basin study.