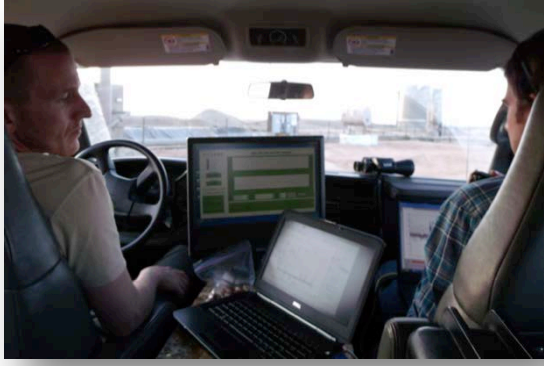
# NOAA Mobile Van and Airborne Sampling in the Uintah Basin and Barnett Shale Plays

**Mobile Lab**
**surface sampling, source signatures**

**Light Aircraft**
**regional sampling, source quantification**


NOAA Earth System Research Laboratory, Boulder, CO
University of Colorado, Boulder, CO
Scientific Aviation, Sacramento, CA

# Instrumentation: NOAA Mobile Lab



Displays of measurements

- In situ CH4 and Ethane: natural gas markers
- In situ CO2, CO: combustion markers
- In situ NO/NO2: combustion markers, ozone precursors
- In situ VOCs (aromatics, oxygenates): ozone precursors
- In situ O3 (two instruments)
- 240 discrete air samples: CH4, CO, CO2, C2-C8 alkanes, aromatics
- Daily operations: 3-5 people on site

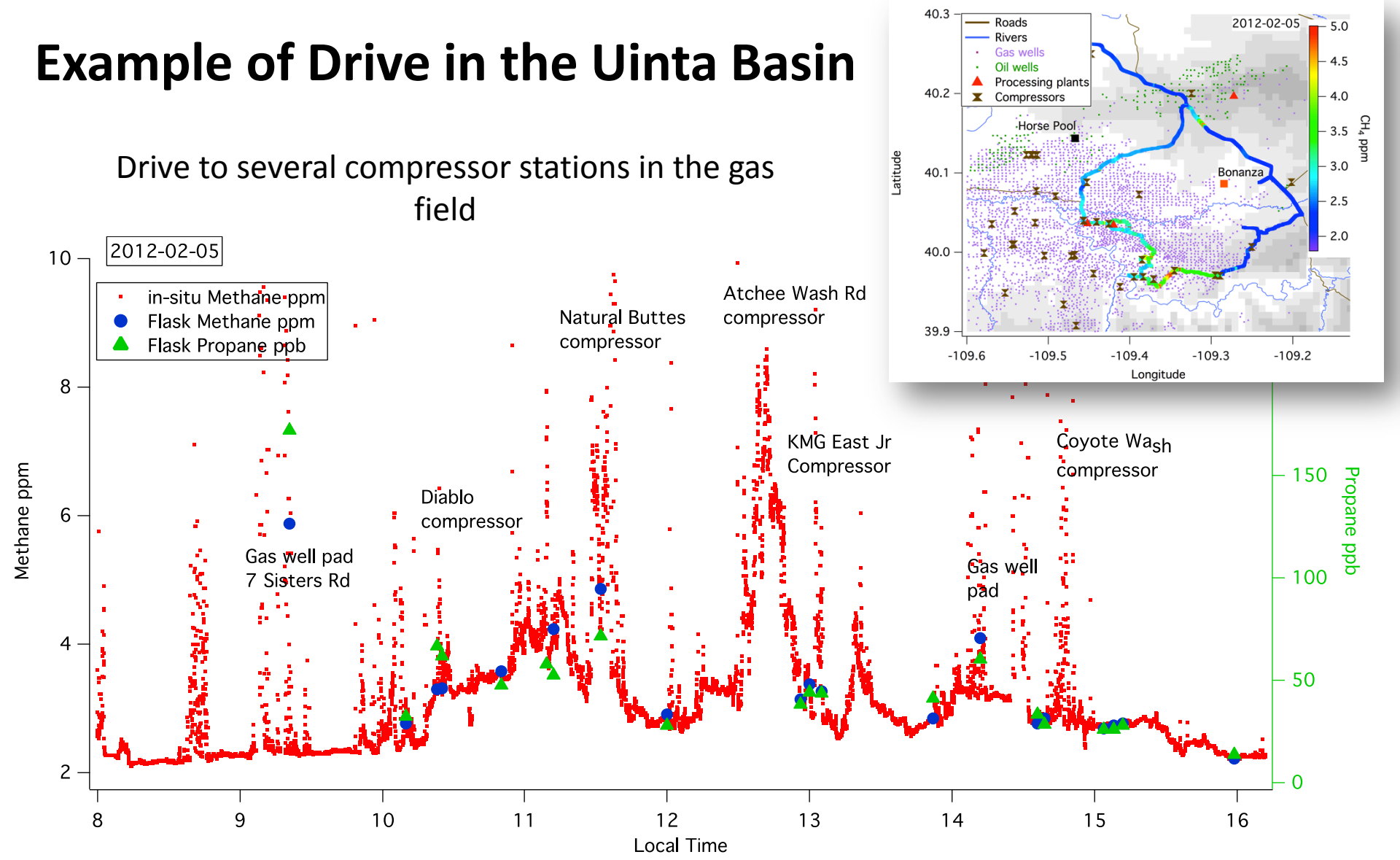
NO, $NO_2$

flasks

VOCs

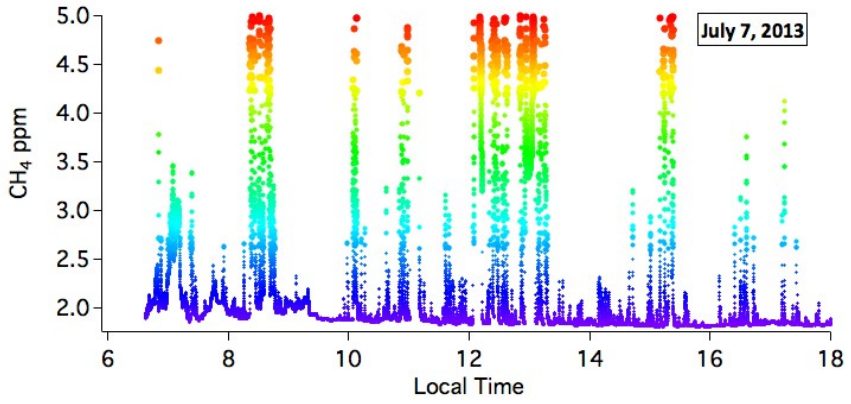
$CH_4$, CO, $CO_2$

# Example of Drive in the Uinta Basin

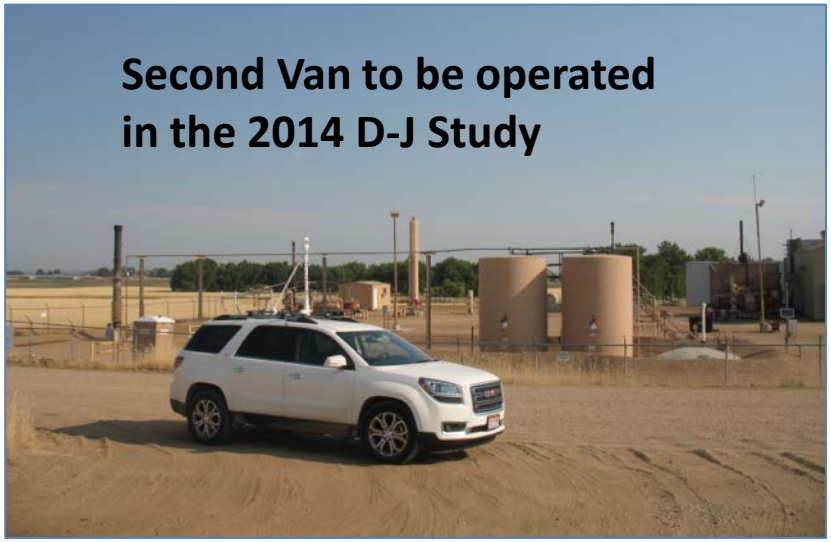


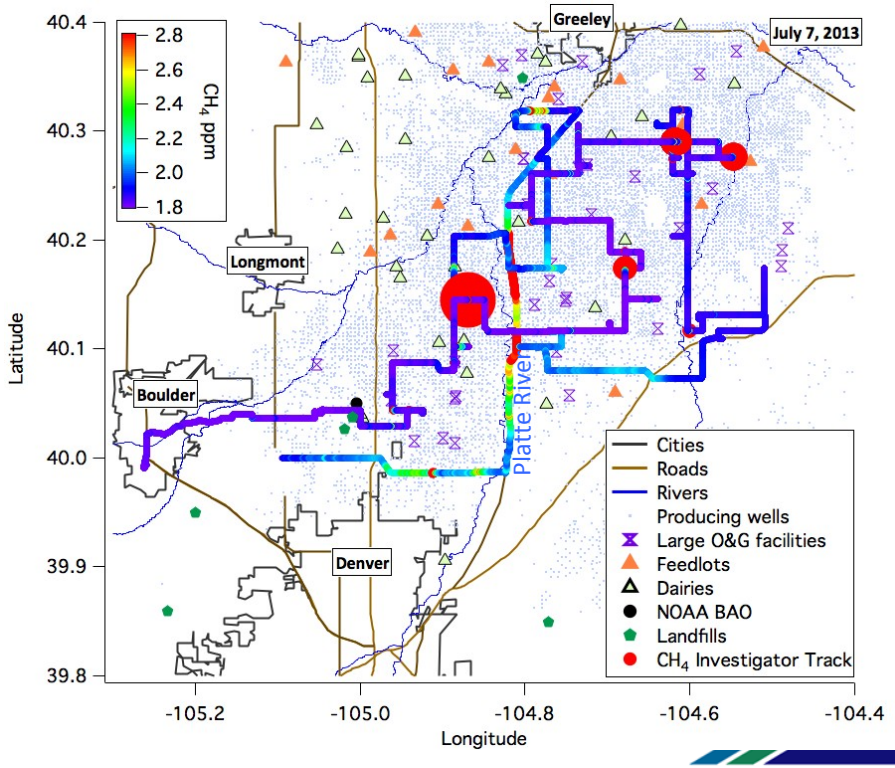

Fugitive emissions of natural gas are substantial at several locations in the oil & gas fields.

# D-J Basin Oil and Gas Field Drive




Methane Investigator Survey
on July 7, 2013 in CO Front Range.
A few hot spots are visible in the data, indicative of nearby sources/leaks. Early day sampling shows accumulation along the Platte River.




NOAA

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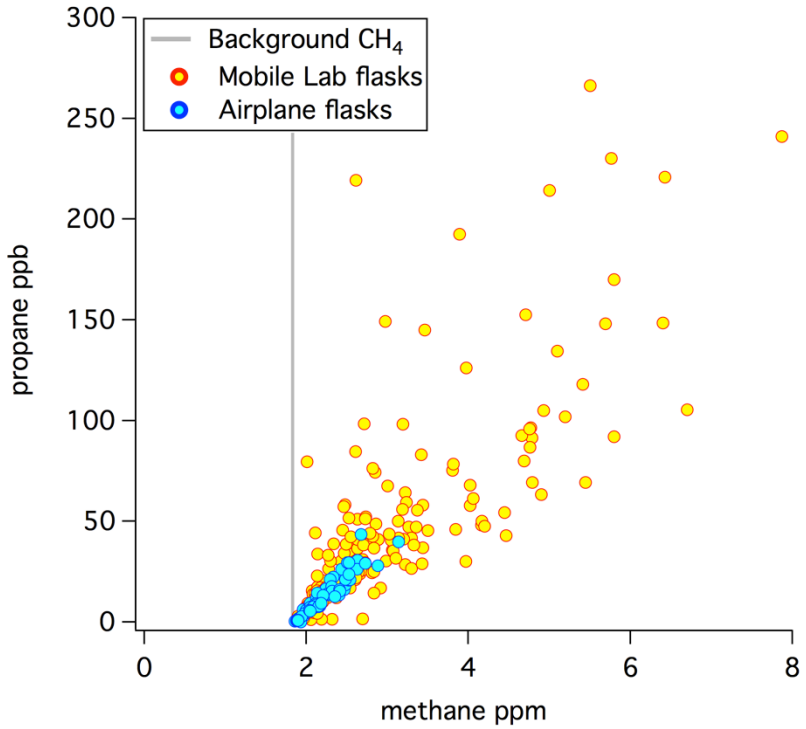
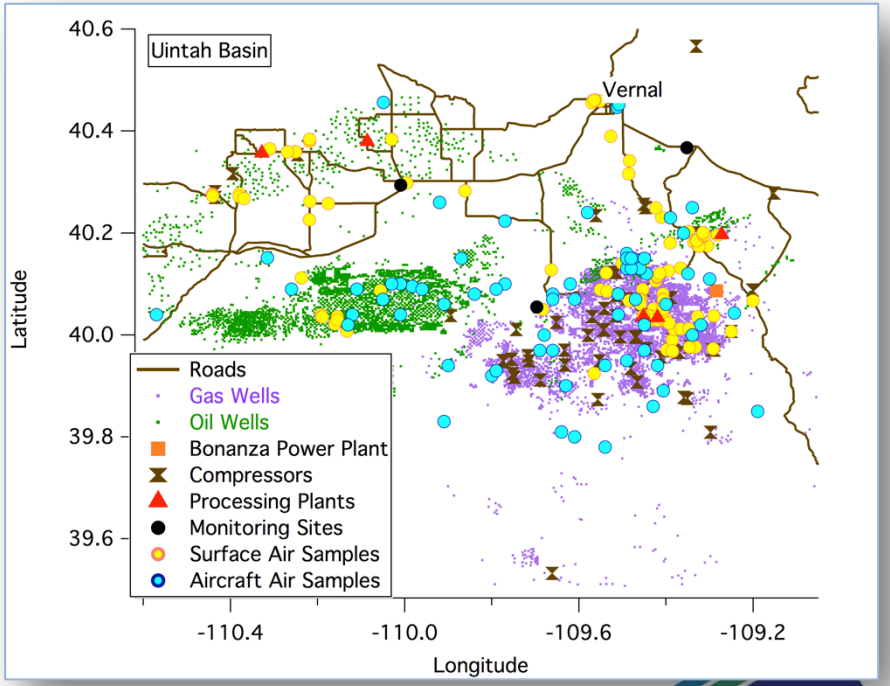
# Flask Samples: Ambient Level Mapping for VOCs In the Uintah Basin




- Mobile Lab: 240 flasks
- Airplane: 81 flasks
- Collected in various areas in the oil and gas Basin




Example of flasks data:
The airplane sampled the mixture of emissions while the Mobile Lab was able to target specific sources.

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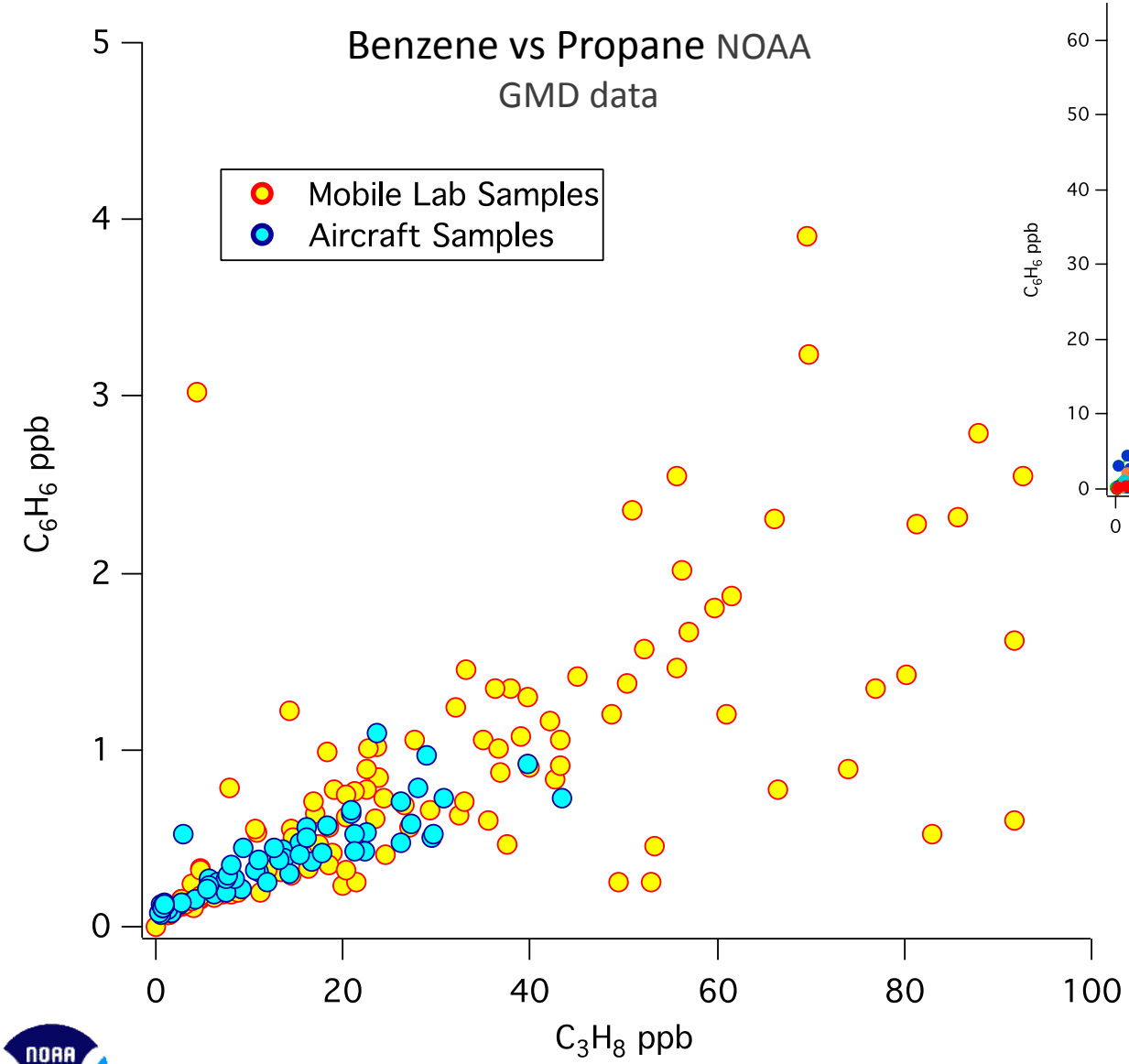
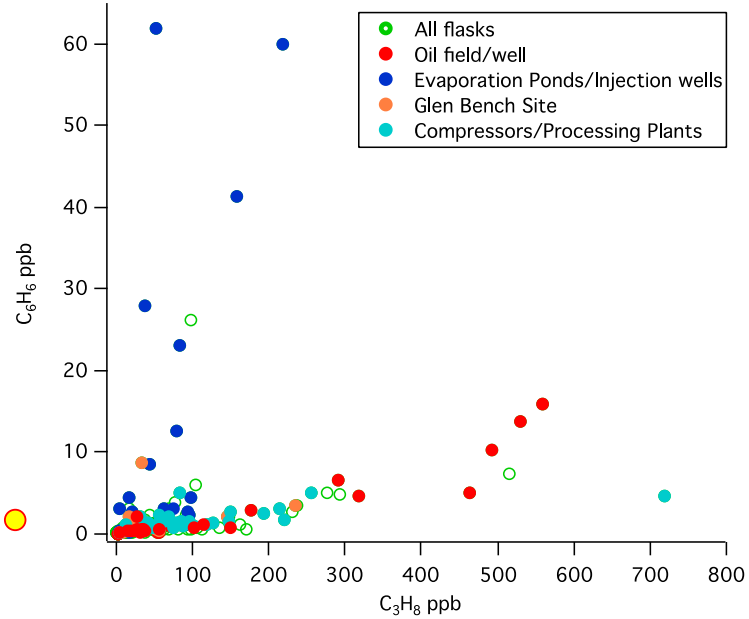
# Discrete air samples measurements, Uintah Basin




The Mobile Lab data show different chemical signatures depending on the point sources sampled.

# Instrumentation: NOAA Light Aircraft


Refueling at Vernal Airport

- In situ CH4 and Ethane: natural gas markers
- In situ CO2 (CO): combustion markers
- In situ NO2: combustion marker, ozone precursors
- In situ O3 (two instruments)
- 81 discrete air samples: CH4, CO, CO2, C2-C8 alkanes, aromatics
- Daily operations: 2 people on site, 1-2 remotely


Data Display

Inlets under wing

Navigation system


* Pictures: Sonja Wolter

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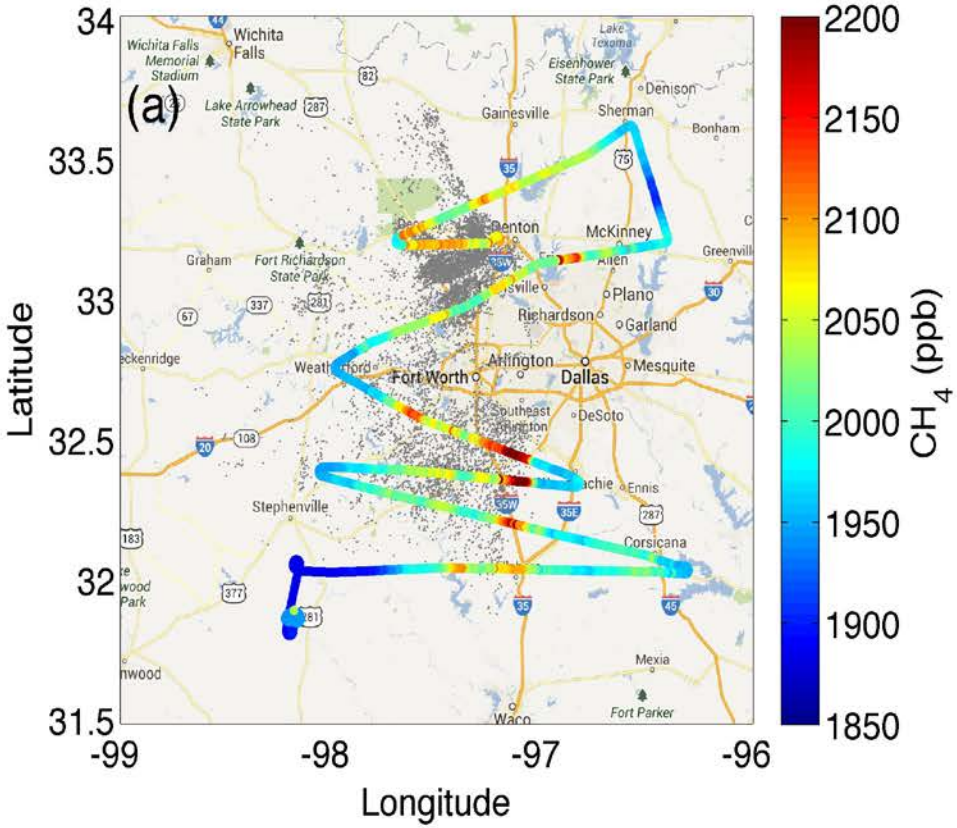
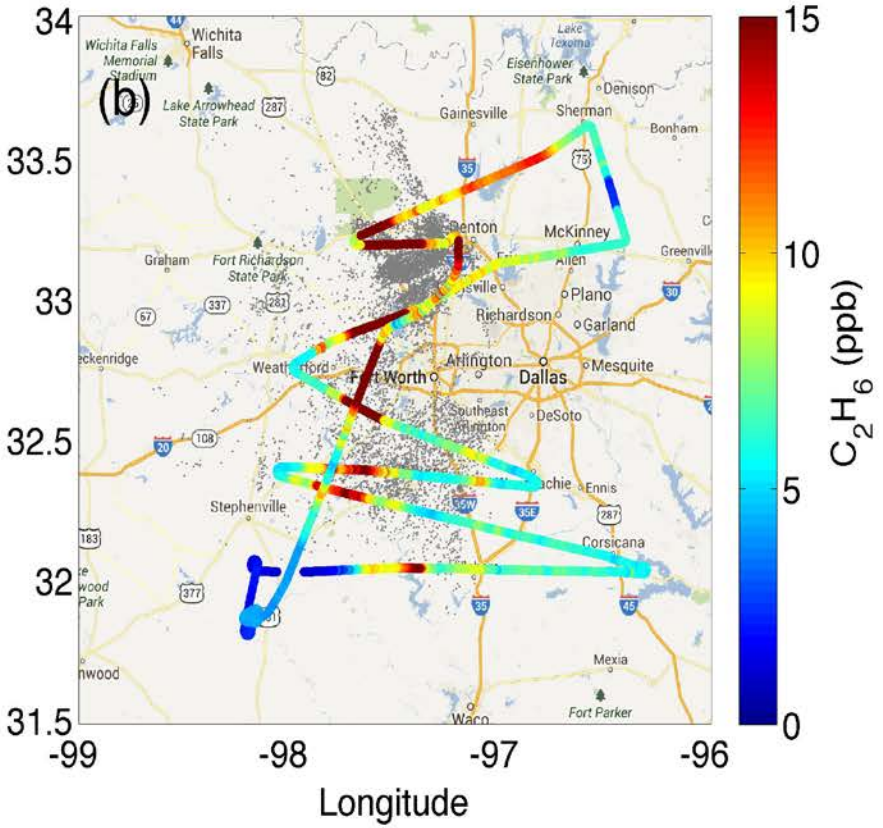
# NOAA Airborne Measurements

Barnett Shale, Texas, Oct 17 2013. Light winds. Gray points are gas wells.

## $CH_4$ (methane)

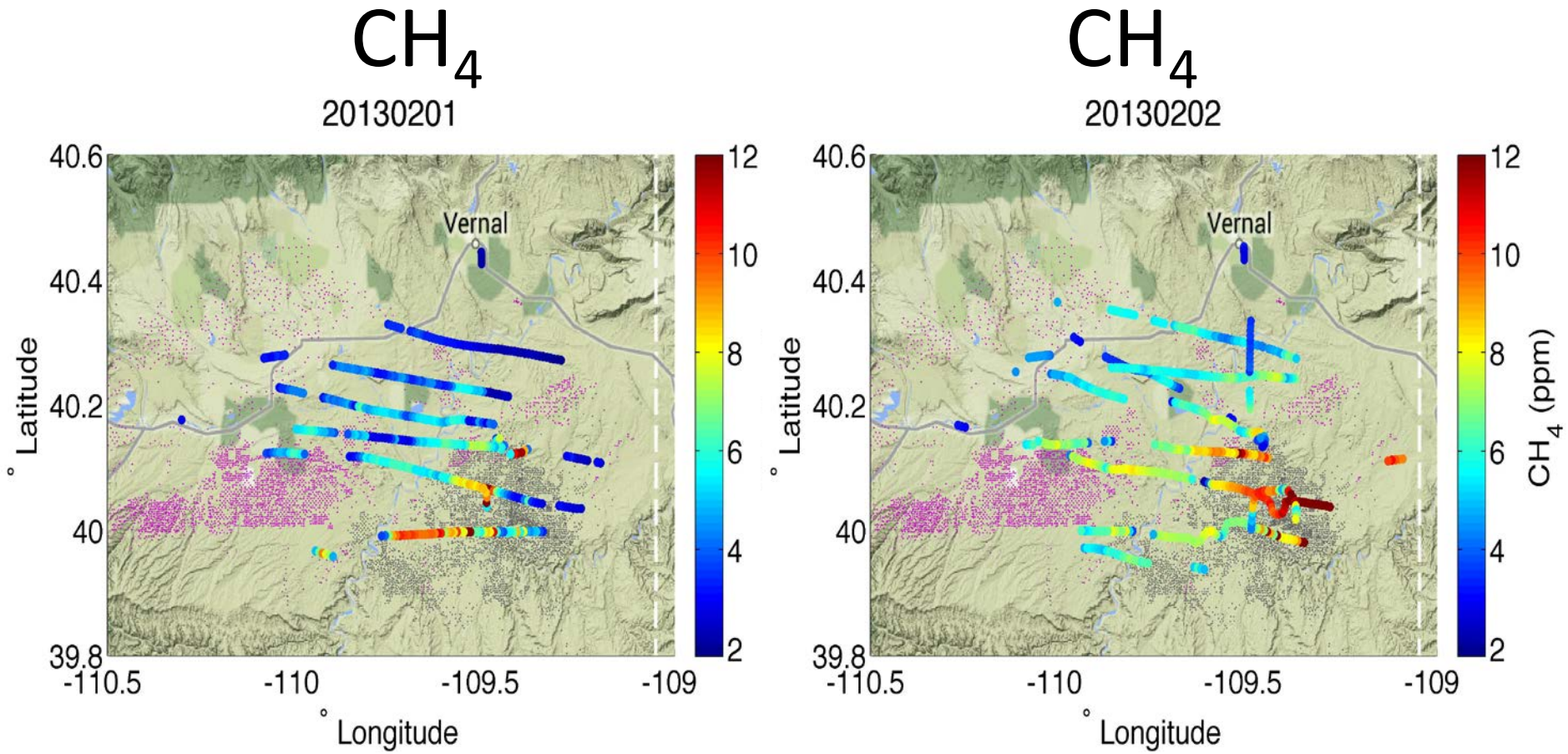



## $C_2H_6$ (ethane)



## NOAA Airborne Measurements

Uintah Basin, Utah, February 1 (left) and February 2 (right), 2013. Light winds during temperature inversion. Only showing data below 1650 masl (within the inversion layer). Gray points are gas wells; purple are oil wells.

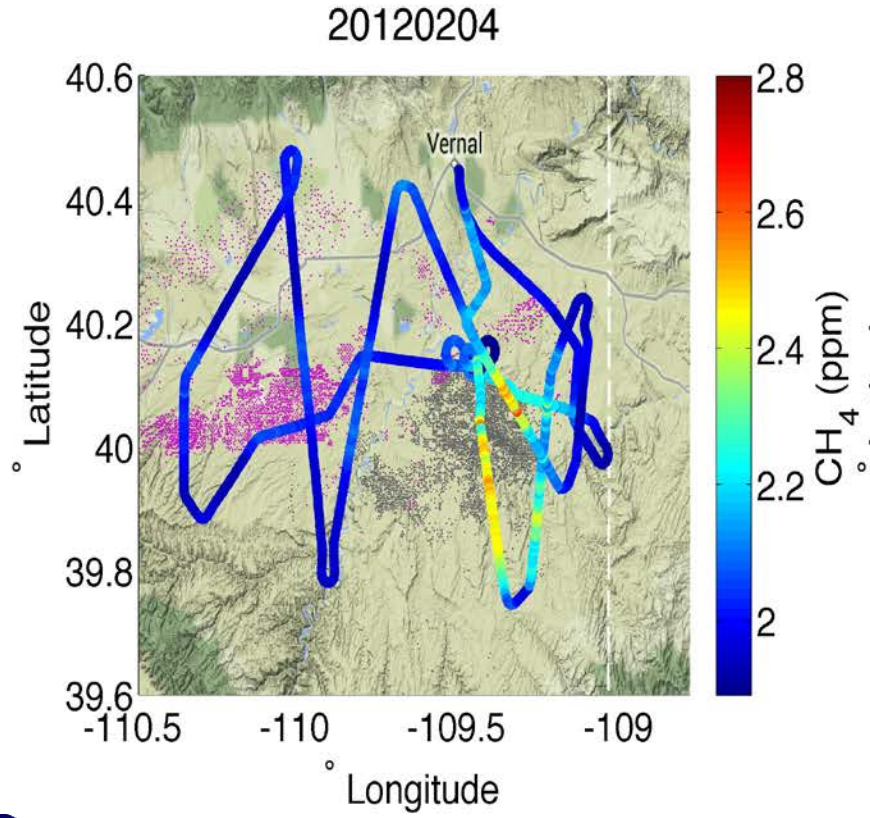


# NOAA Airborne Measurements

Uintah Basin, Utah, February 4 (left) and February 8 (right), 2012. Light winds. Gray points are gas wells; purple are oil wells.

**High Altitude above inversion**

$CH_4$




**Low Altitude below inversion**

$CH_4$