

Mobile field studies to quantify agricultural nitrogen and methane emissions

T. Ryerson – NOAA ESRL - FRAPPÉ planning meeting April 2014

Agriculture and animal husbandry practices emit nitrogen compounds (NH_3 , N_2O , and NO_x) and methane (CH_4) to the atmosphere

These emissions are relevant to **climate forcing**, **air quality**, and **stratospheric ozone**
→ better knowledge needed to guide tradeoffs of *feeding a globally growing population*

These emissions are imperfectly represented in inventories:

NH_3 from dairy cattle feedlots (*Nowak et al., 2012, GRL*)

CH_4 from rice paddies (*Peischl et al., 2012 JGR*)

N_2O from fertilizer use (*Xiang et al., 2013 JGR*)

} e.g., CalNex analyses

Short-term, intensive field measurements using a mobile laboratory in Colorado will provide key constraints on inventory values of agricultural (cropland and feedlot):

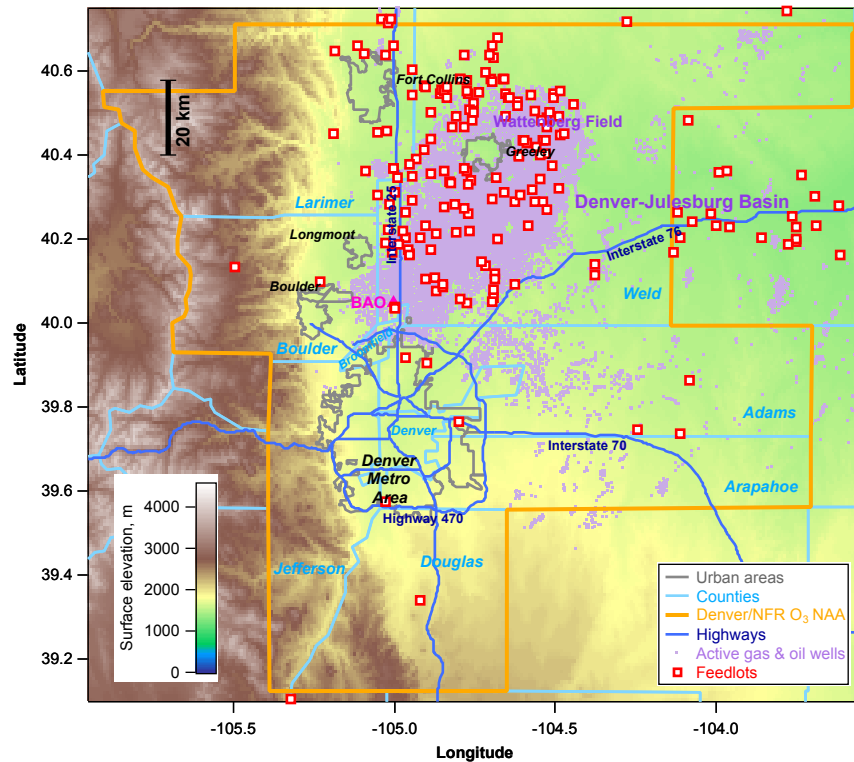
emission ratios

spatial distributions

daily variability

seasonality

Initial deployment planned for Summer ~~2013~~ **2014**



Summer 2014 van payload will measure

- NH_3 , N_2O , NO , and NO_2
- CH_4 and CO_2
- O_3 and CO
- C_2H_6 an outside possibility

Begin surveys in Colorado to quantify

- Emissions ratios
- Spatial distribution
- Daily variability
- Seasonality

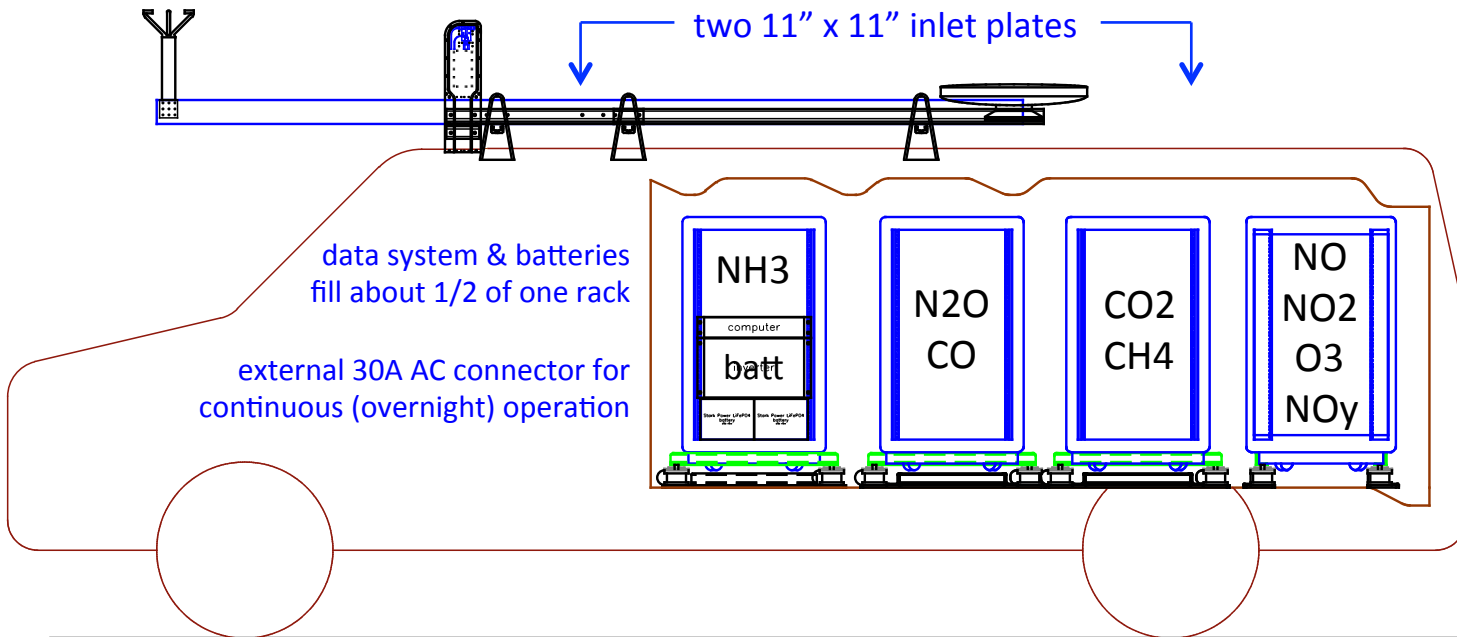
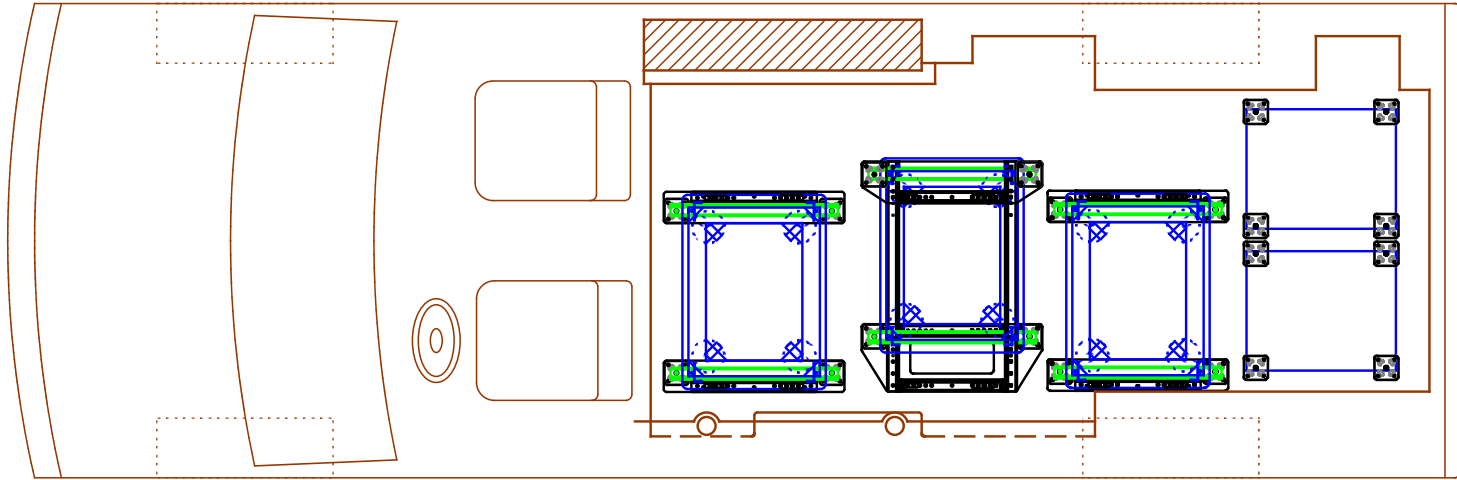
Van surveys provide data on **gas & oil** and **ag/feedlot** emissions in this region



gas & oil



feedlots





parameter

location ± 1 m
 heading $\pm 0.5^\circ$
 true wind speed ± 0.5 m/s
 true wind direction $\pm 2^\circ$
 6-axis acceleration ± 0.1 g
 altitude ± 5 m
 air temperature $\pm 1^\circ\text{C}$
 cabin temperature $\pm 1^\circ\text{C}$
 relative humidity $\pm 4\%$
 air pressure ± 0.4 mb

accuracy

110vAC power up to 2000 W
 12vDC power up to 2000 W
 battery backup 2 hrs @ max load

16 serial data inputs; analog and digital I/O
 configurable display/control software
 GPS and route planning aids
 moving map and weather radar

configurable rooftop plates for inlets
 up to 5 shock-mounted 20U electronics racks