

ARS NP212 CLIMATE CHANGE, SOILS AND EMISSIONS PROGRAM UPDATE

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- * **ARS NP212 CLIMATE CHANGE, SOILS AND EMISSIONS PROGRAM UPDATE**
- * **REAP/GRACENET DATABASE PROGRESS REPORT**
- * **SAMPLE RESEARCH FROM KENTUCKY**



ARS NP212 CLIMATE CHANGE, SOILS AND EMISSIONS PROGRAM UPDATE

- ▶ ARS NP212 Retrospective Review – end of 5 year research cycle
 - ▶ Stakeholder webinar workshop conducted Dec. 3, 2014
 - ▶ Draft of Action Plan for next five years for NP 212 was put together using stakeholders', NP 212 scientists' , NP 214 scientists' and other customers' input
 - ▶ Program Direction and Resource Allocation Memo (PDRAM) process starts soon and Program Review Panel at a later date



ARS NP212 CLIMATE CHANGE, SOILS AND EMISSIONS PROGRAM UPDATE

- ▶ **Natural Resources & Sustainable Agriculture Programs Reorganization**
 - ▶ Due to changing priorities and for better project alignments, NP 214 (Agricultural and Industrial Byproducts) and NP 212 (Climate Change, Soils, & Emissions) were merged.
 - ▶ For better alignment, some projects from NP212 were transferred to NP 216 – Agricultural System Competitiveness and Sustainability that will now have a new research program component (Genetics x Environment x Management (GxExM) interactions).
 - ▶ More cross-disciplinary research projects
 - ▶ These projects moving to GxExM will also go through Program Review Panel at a later date
 - ▶ Charlie Walthall moving to NP216
 - ▶ Position for National Program Leader for NP 212 is currently being advertised

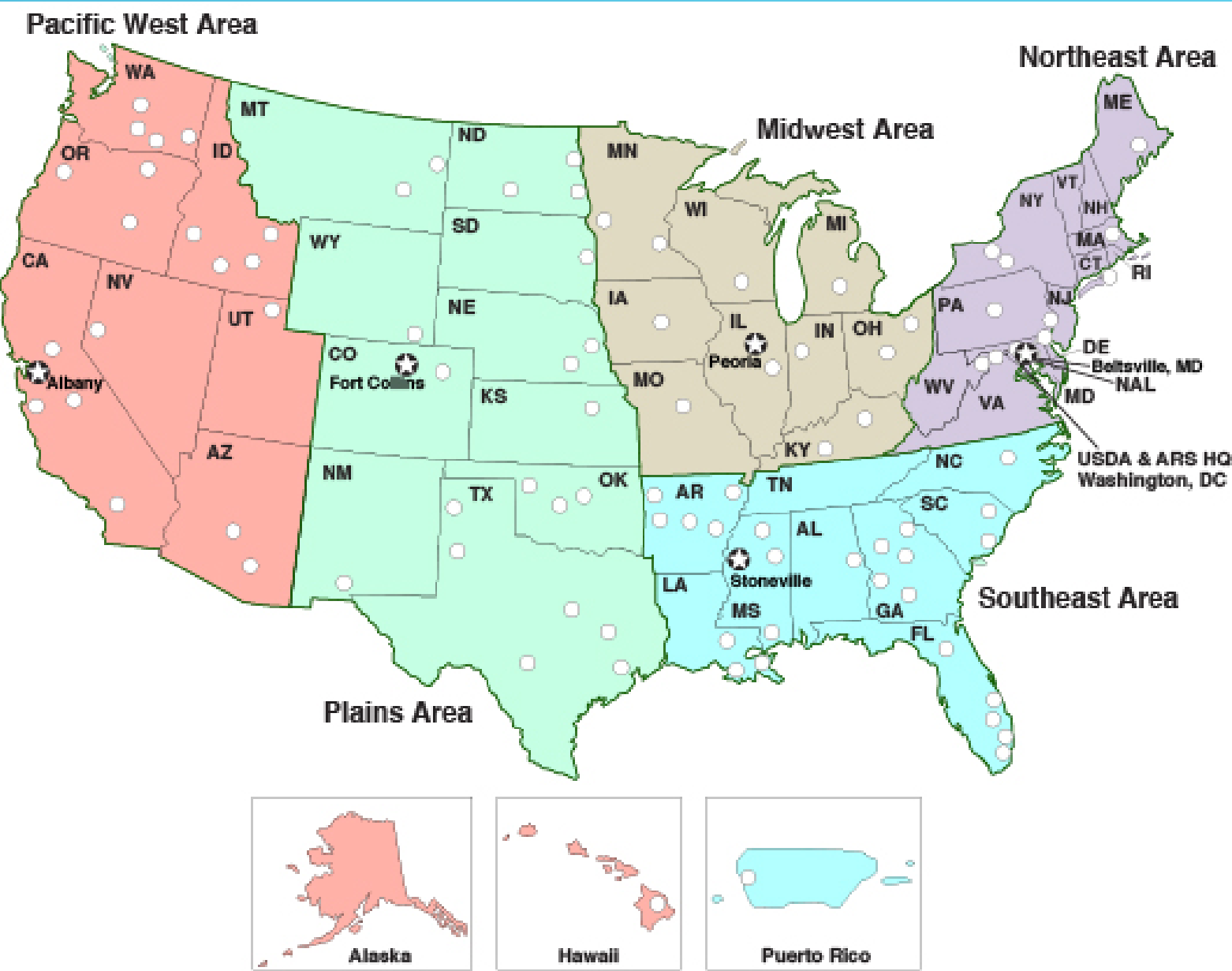


ARS NP212 CLIMATE CHANGE, SOILS AND EMISSIONS PROGRAM UPDATE

- NP212: Soils & Air
 - Soils research
 - Air quality research – Air Quality Researchers Working Group
 - Including Animal systems, manure
 - GRACEnet & Livestock GRACEnet
 - REAP – will focus on soil health/sustainability
 - Renewable Economic Agricultural Practices
- Future Activities
 - USDA-EPA Ammonia Research Group
 - New Soil biology working group
 - Soil Health partnership with NRCS
 - Rangeland Wind Erosion working group
 - Data stewardship: ARS –wide (“Big Data”)
 - Internet-2 lines
 - More computing power

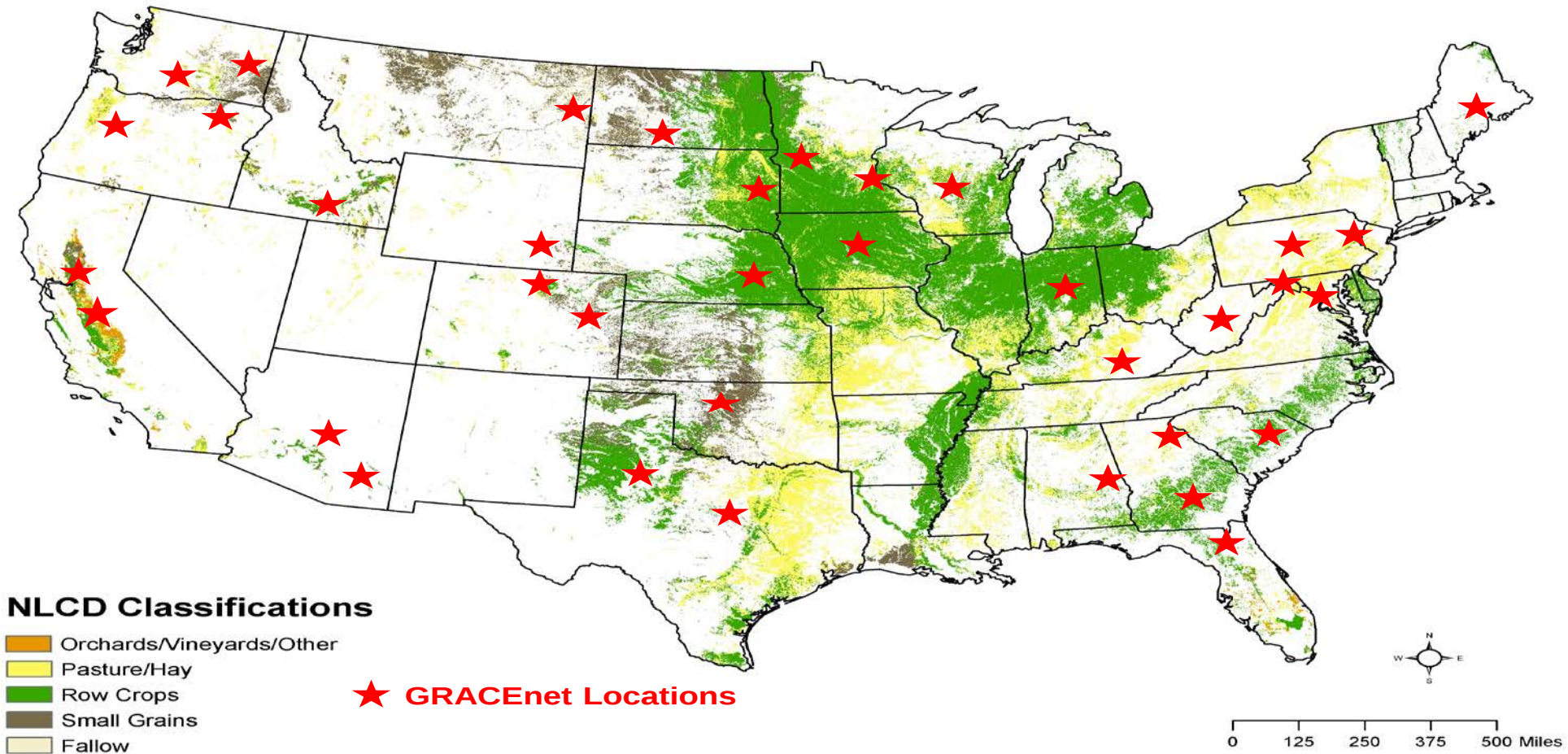


AREA CONSOLIDATIONS



* REAP/GRACENET DATABASE PROGRESS REPORT





Evaluate soil C status & change

Determine net GHG emission (CO₂, CH₄ and N₂O)

Determine environmental effects (water, air and soil quality)

Model Results Progress

- Currently, users can query IPCC Tier 1 predictions for N₂O emissions (1% of N additions) at the site and treatment levels.
- County level maps of N₂O emissions generated by DayCent simulations reported in the US National GHG Inventories are also available
- Future: Implement ability to conduct DayCent, and other process based model simulations, for particular site/treatment combinations “on the fly”

Pre-release data – as of 10/24/2014

- 22 locations provided additional data

REAP pre-release: <http://nrrc.ars.usda.gov/arsdataportal/#/Home>

- 15 unique site ID (compared to 10 in public)

GRACEnet pre-release:

<http://nrrc.ars.usda.gov/arsdataportal/#/Home>

- 34 unique site IDs (compared to 15 in public version), update of public in January.

Progress Highlights

- **The ARS Data Portal (GRACEnet, REAP, STEWARDS) now offers:**
- Use of higher visibility keywords and search engines to better locate the portal on the web
- Improved transmission speed and failover capabilities (10G) due to cluster-based servers
- Additional GIS capabilities

<http://nrrc.ars.usda.gov/arsdataportal/#/Home>

<http://nrrc.ars.usda.gov/dpasa/#/Home>

Progress Highlights

- **The ARS Data Portal (GRACEnet, REAP, STEWARDS) Current Endeavors:**
- Data team/data contributors in the process of evaluating and testing new applications
- Working with CSU to facilitate data download for modeling purposes
- Partnership with Justin Derner (ARS-RRRU) to tie into remotely sensed LTAR data
- Possible data mining collaboration with private industry

* EXAMPLE RESEARCH FROM FAES (KENTUCKY)

FAES=FOOD ANIMAL ENVIRONMENTAL SYSTEMS
RESEARCH UNIT

-N₂O LOSS FROM SOIL N TREATMENTS

-AIR QUALITY TRAILER FOR ONLINE NH₃/VOC/PM
MEASUREMENTS

Experiment Information

Site: Warren County, Kentucky

Soil: Crider Silt Loam, 3% sand,
65% silt, and 32% clay;
SOM of 2.5% and pH 5.8.

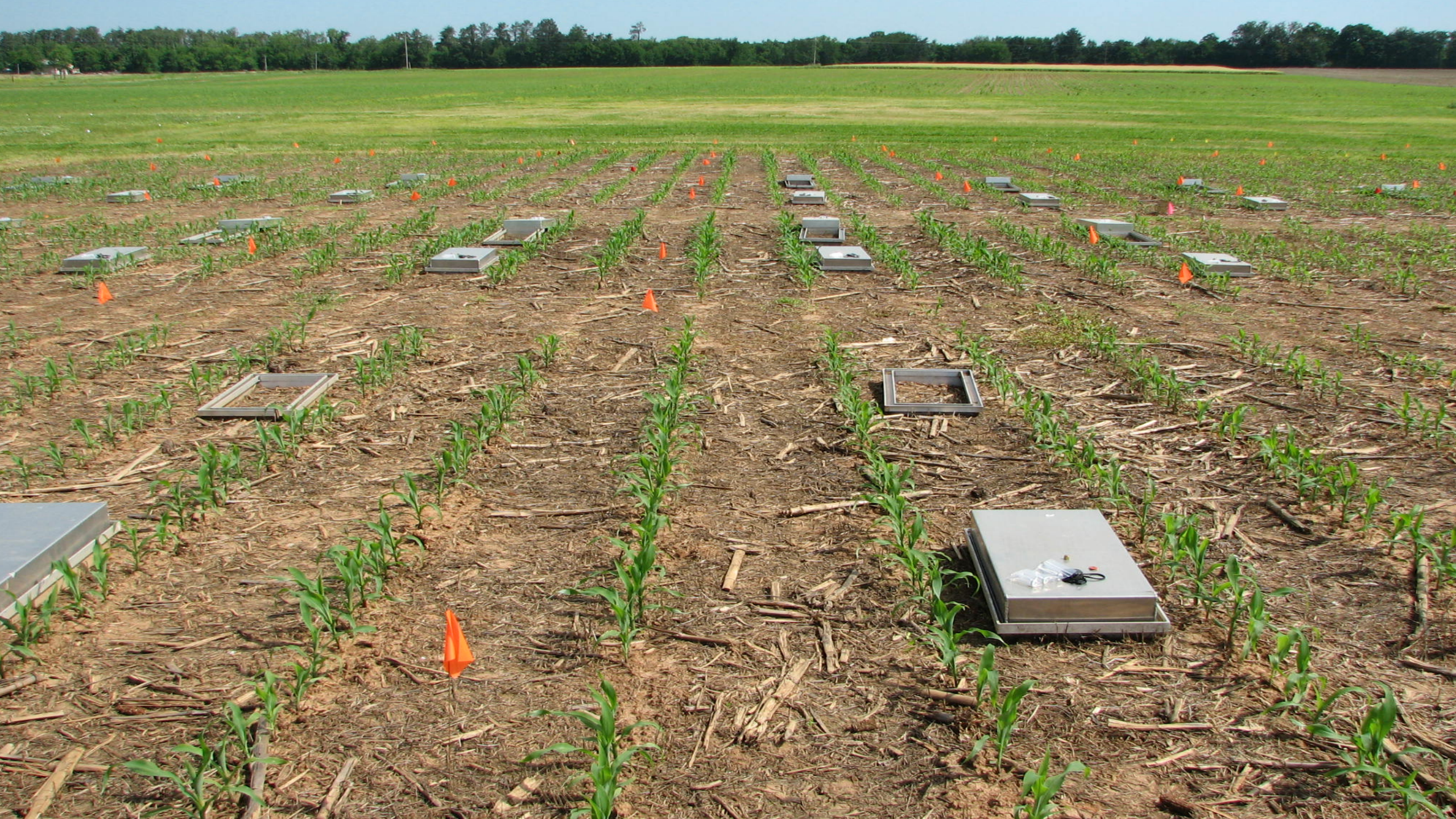
Crop: No-till Corn

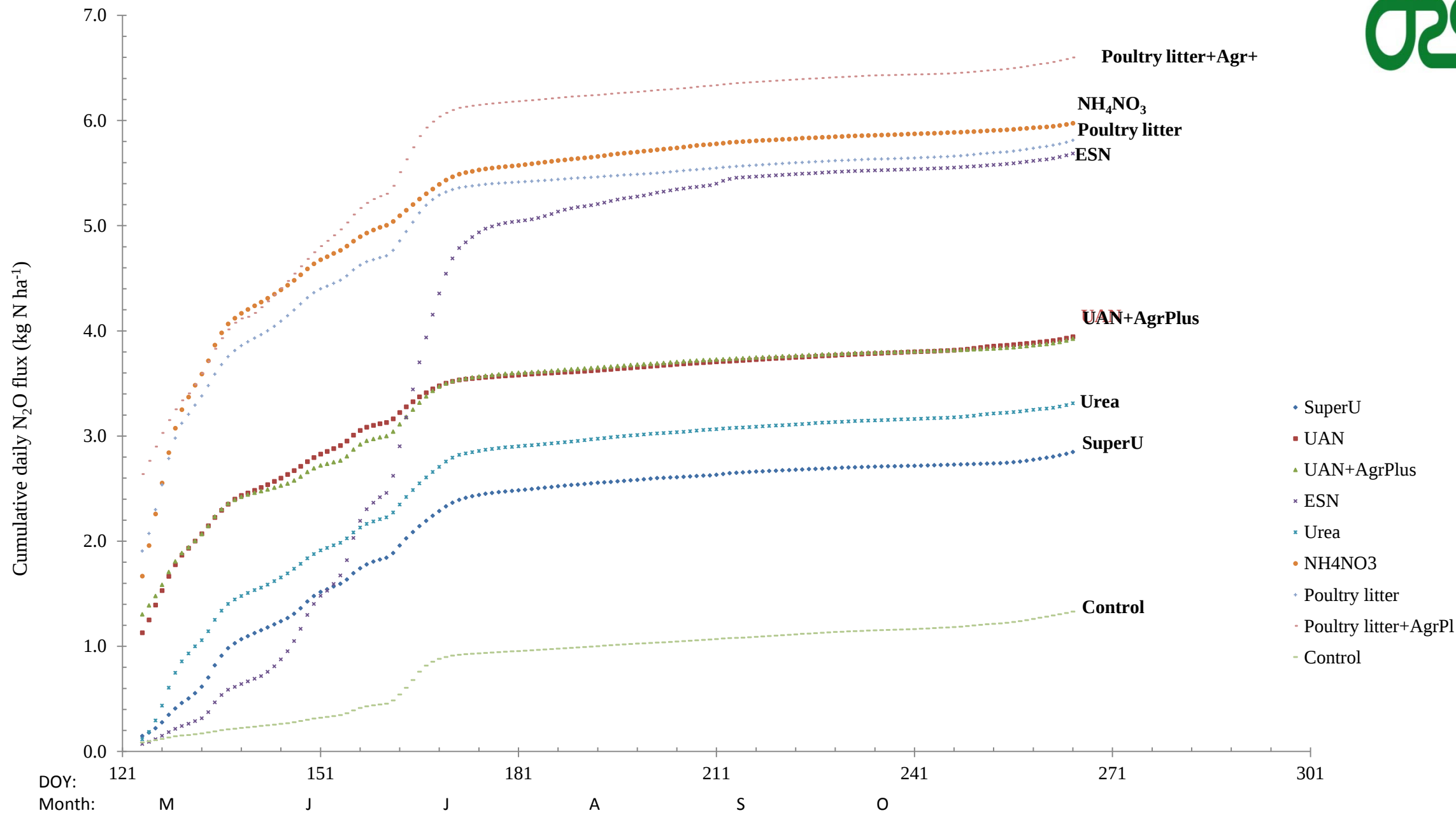
N sources:

1. Polymer-coated urea (ESN ®), 44% N
2. UAN, 28 % N
3. NH_4NO_3 , 34 % N
4. Urea, 46% N
5. Super U ®, 46% N
6. UAN + AgrotainPlus, 28 % N
7. Poultry litter, 3% N
8. Poultry litter + AgrotainPlus, 3 % N
9. Control (no N applied)

Litter was applied at 303 kg N ha⁻¹ (271 lb N/A); other treatments at 168 kg N ha⁻¹ (150 lb N/A).







Effects of N sources on corn grain yield and cumulative N₂O emissions under continuous corn in no-till production system.

Treatment	Grain Yield		N ₂ O Emissions
	Bu/acre	kg ha ⁻¹	kg N ₂ O-N ha ⁻¹
Control	113	7130 b	1.3 e
ESN	144	9077 a	5.7 ab
UAN	164	10291 a	3.9 b
NH ₄ NO ₃	164	10335 a	6.0 ab
Urea	169	10650 a	3.3 c
Super U	180	11322 a	2.8 cd
UAN + AgrotainPlus	166	10440 a	3.9 b
Poultry litter	169	10631 a	5.8 ab
Poultry litter+AgrotainPlus	167	10522 a	6.8 a

Means followed by the same letters are not significantly different $\alpha=0.05$

Developing the Capacity for Continuous/Online/Real-time Measurements of Relevant Agricultural Compounds

Gas Emissions and Particulate Matter

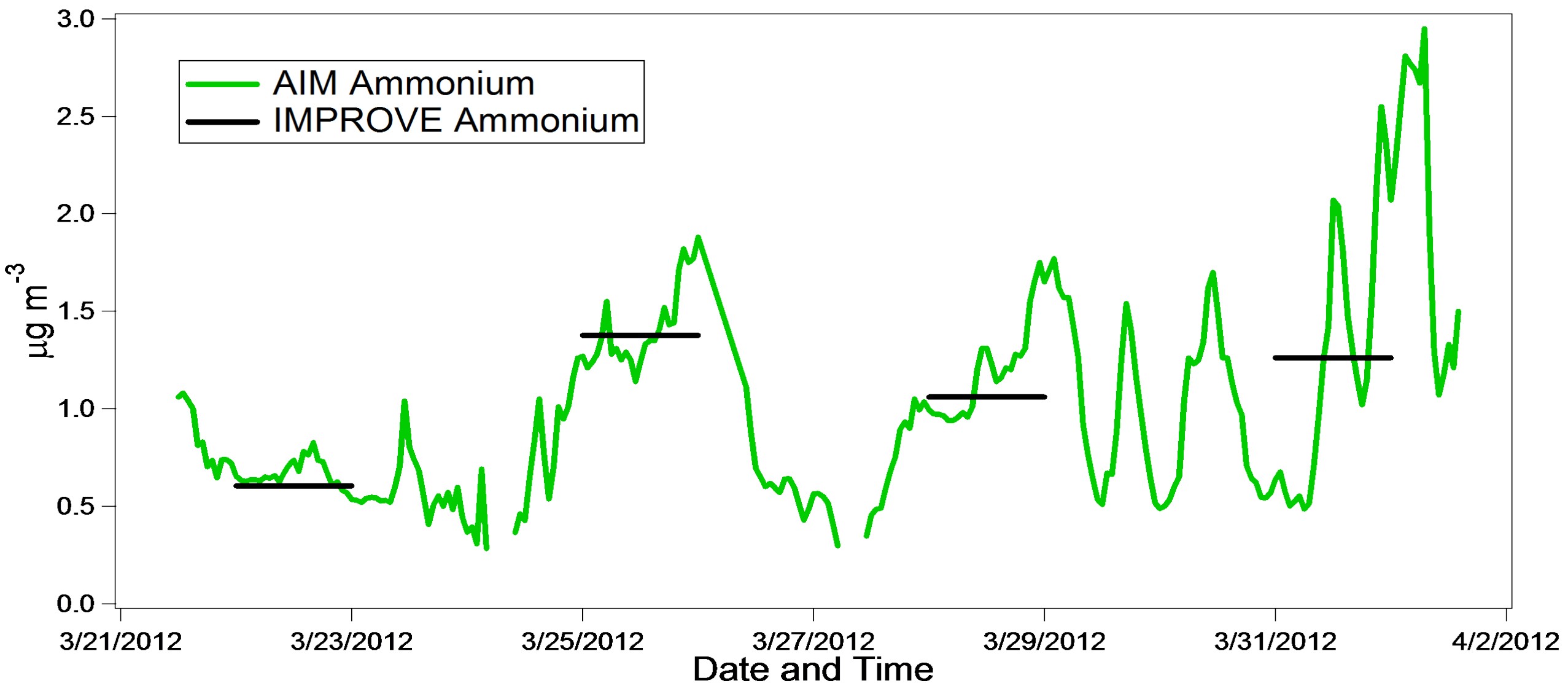
- Increasingly clear that the interactions between gas phase emissions and particulate formation “Secondary Aerosol” is an issue
 - NH_3 / VOC $\rightarrow$ PM but also reactions between “urban” and “rural” sources
- What do we need to get a handle on this?
 - Partitioning between the two phases (g) $\leftrightarrow$ (s, l) = Need data on **BOTH**
 - Chemistry, meteorology can be rapid = Need real-time/online data
 - Low concentrations = Sensitive Instrumentation
- In support of future field studies, we have put together an air quality trailer equipped with instrumentation providing faster temporal data

FAES Air Quality Trailer

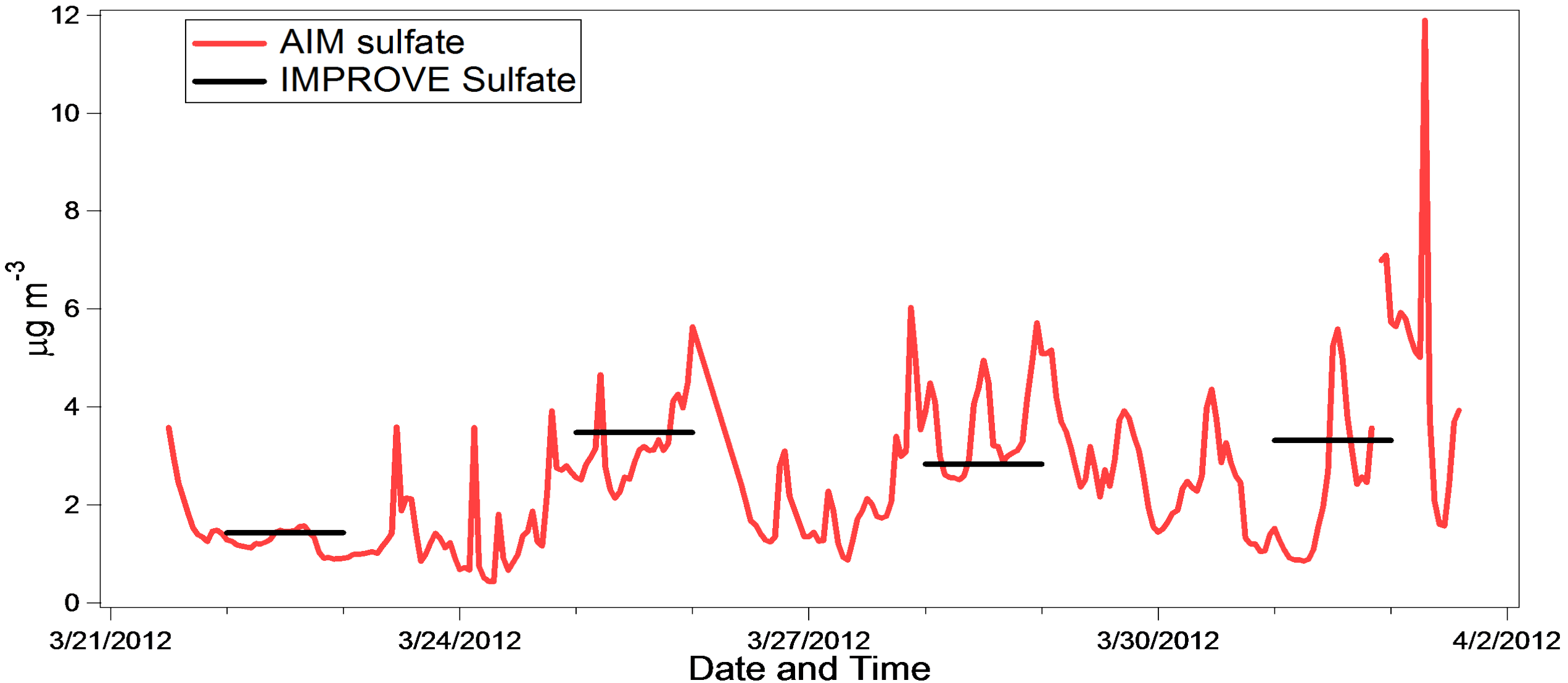
Instrumentation	Analytes
Ambient Ion Monitor (ion chromatography)	Gas and particulate ions (NH_4^+ , NO_3^- , SO_4^{2-} , amines, carboxylic acids), 30 minutes
TrsMedor (GC)	H_2S , thiols, disulfides, 10 minutes
Scanning Mobility Particle Sizer (SMPS)	Particle size distribution and concentration (10- 500 nm) 3 minutes
Aerodynamic Particle Sizer (APS)	Particle size distribution and concentration (0.3-20 μm) 20 seconds
Optical Particle Counter	Particle concentration (0.3-10 μm)
LiCor	CO_2 and water
Photoacoustic	NH_3 and greenhouse gases
Weather station	Temp., RH, wind speed and direction, radiation
Sonic anemometers	3D wind speed



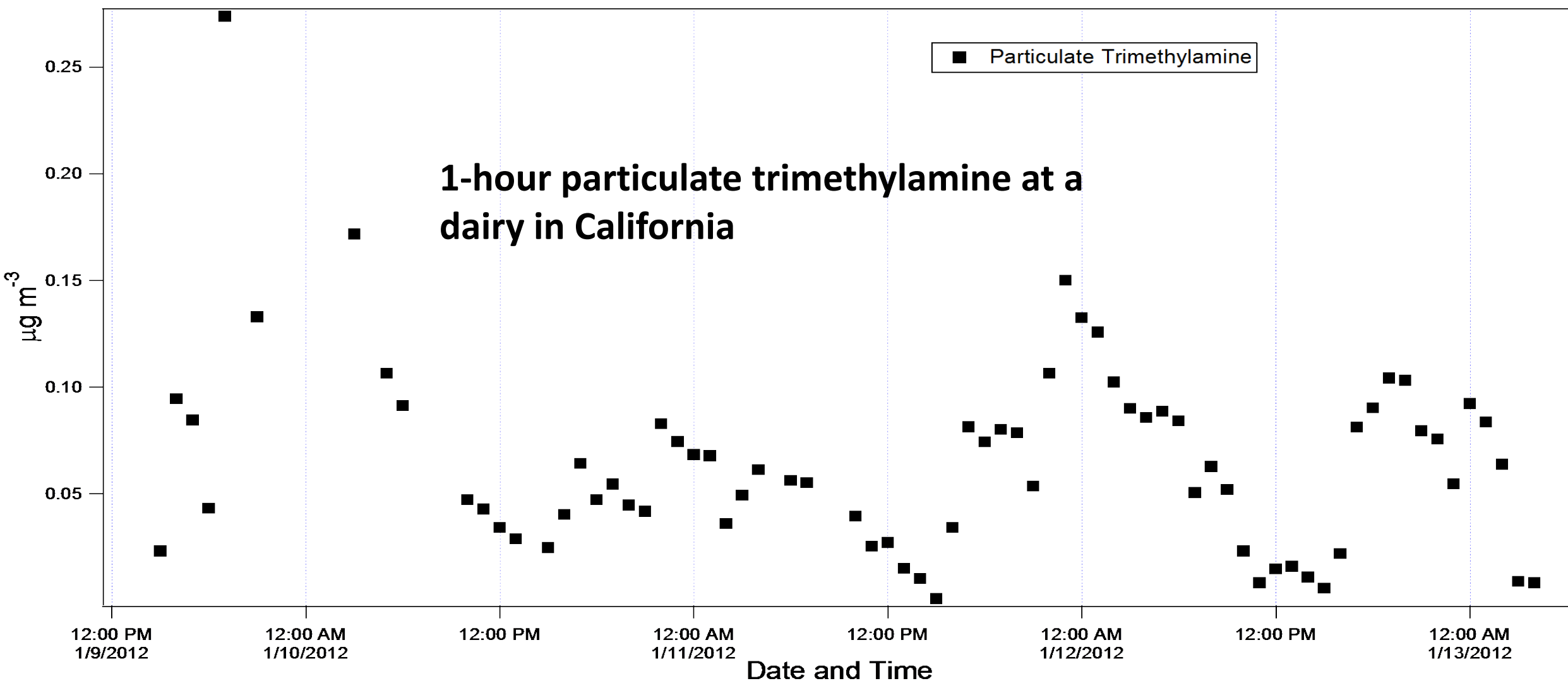
PM Ammonium Comparison at National Park



PM Sulfate Comparison at National Park



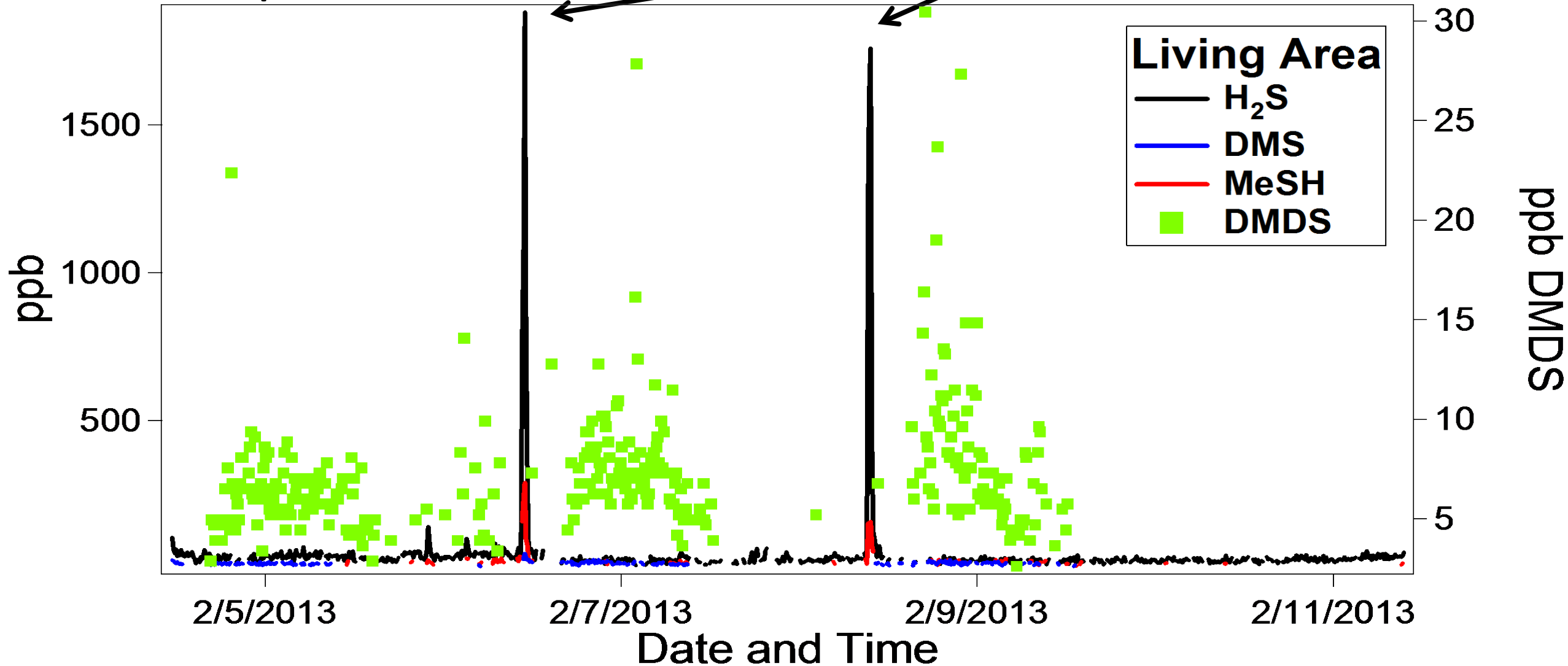
Particulate Trimethylamine



Sulfur Emissions Swine Facility

10 minute reduced
sulfur compounds

Compost Turning



Special Symposium on Agriculture and Aerosols/Particulate Matter

- American Association for Aerosol Research (AAAR)
 - October 12-16, 2015 Minneapolis
 - Abstracts due this Friday (but probably be extended a week...)
 - All aspects of agriculture and aerosols:
 - Dust
 - Bioaerosols
 - Secondary formation from NH_3 , VOCs, etc.
 - Measurements, Fate, Remediation, Effects