Kansas City Transportation and Local-Scale Air Quality Study (KC-TRAQS)

Authors:

Stephen Krabbe (presenting), Sue Kimbrough, Stephen Neil Feinberg, Steven Brown, Matt Brown, Carry Croghan, Amara Holder, Parikshit Deshmukh, Tim McArthur, Michael Davis, Amy Bhesania, Amy Shields

KC-TRAQS RESEARCH PROJECT

What is it?

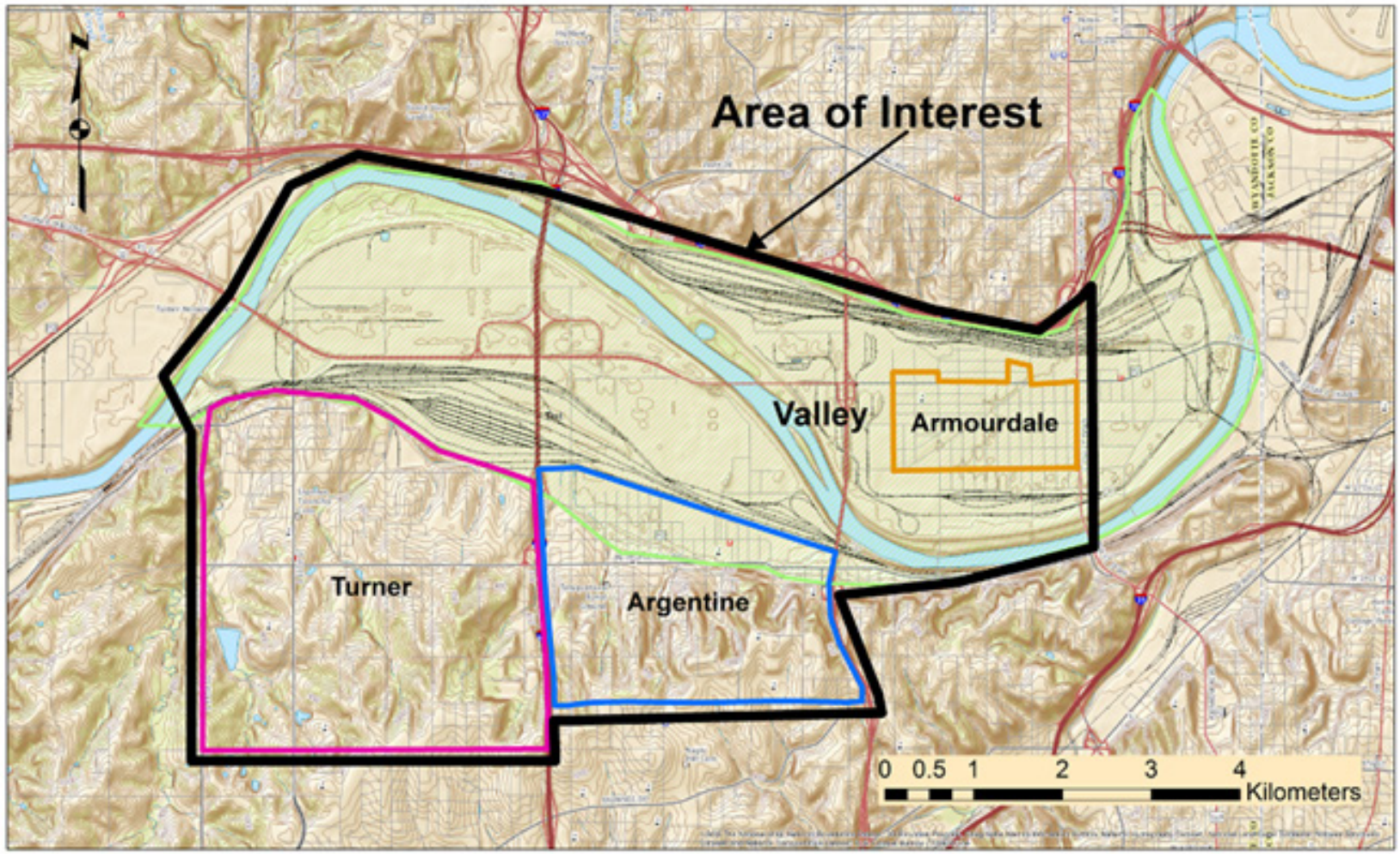
…one year air quality study that utilizes several measurement instrument approaches at multiple locations in the study area.

Purpose:

…to characterize the impact of local air pollution sources ($PM_{2.5}$) in and around the Argentine community including the neighborhoods of Turner and Armourdale. Secondarily will compare different technologies to monitor $PM_{2.5}$ with additional opportunities for "citizen science".

Note: Data results are for research purposes only and not for regulatory purposes.

KC TRAQS RESEARCH PROJECT



Study Overview

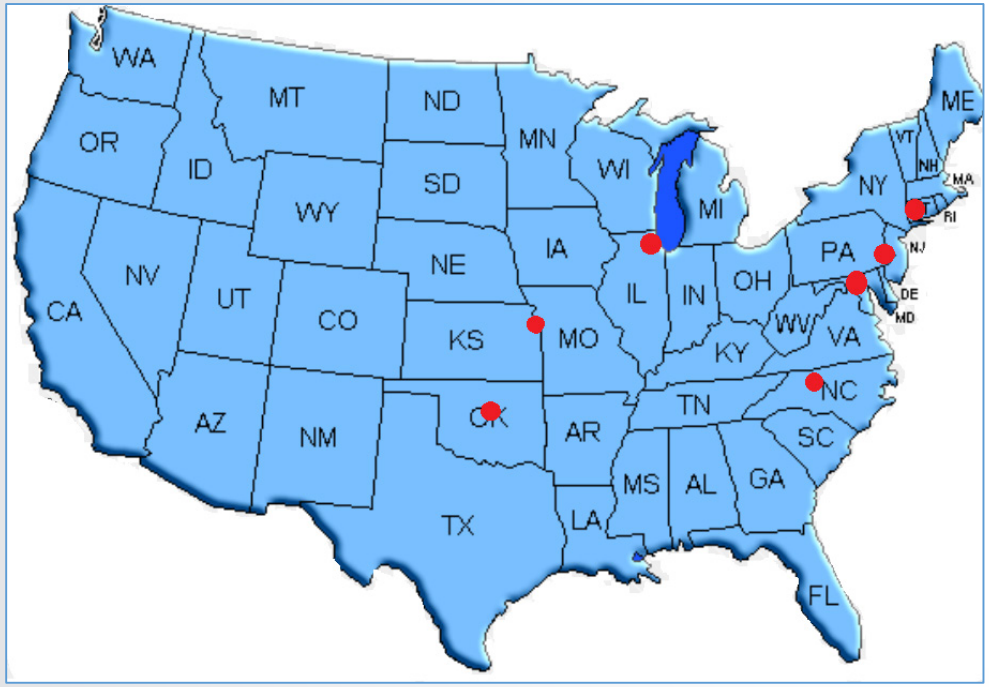
The study aims to answer these three big questions:

- What is the extent of air pollution in the Argentine (KS) neighborhood and the broader SE Kansas City, KS area?
- Can the impact of local air pollution sources on Argentine (KS) neighborhood and the broader SE Kansas City, KS area air quality be identified and quantified?
- What is the variability of the rail-yard air pollution impacts, under different meteorological conditions and source activities?

Science Questions & Drivers

- What is the spatial and temporal extent of local air pollution sources in and around the Argentine (KS) neighborhood?
- Can the impact of local air pollution sources on the Argentine and surrounding neighborhoods' air quality be identified and quantified?
  - ✓ What is the spatial and temporal variability of rail-yard air pollution impacts and other nearby sources, under different meteorological conditions and source activities?
  - ✓ Can the effectiveness of a self-driven community measurement project be quantified? What is the suitability of a sensor instrument package (e.g., AirMapper) to support real-time mapping of particulate matter by citizens?
  - ✓ What is the added value of citizen science in the research process and can this value added be quantified?
  - ✓ What is the suitability and effectiveness of modeling tools to support citizen science in the research process and can this value added be quantified?

Similar Studies



Rail Yard Studies

1. Atlanta
2. Chicago

Evaluation of local-scale air pollution trends using **stationary** and **mobile** monitoring.

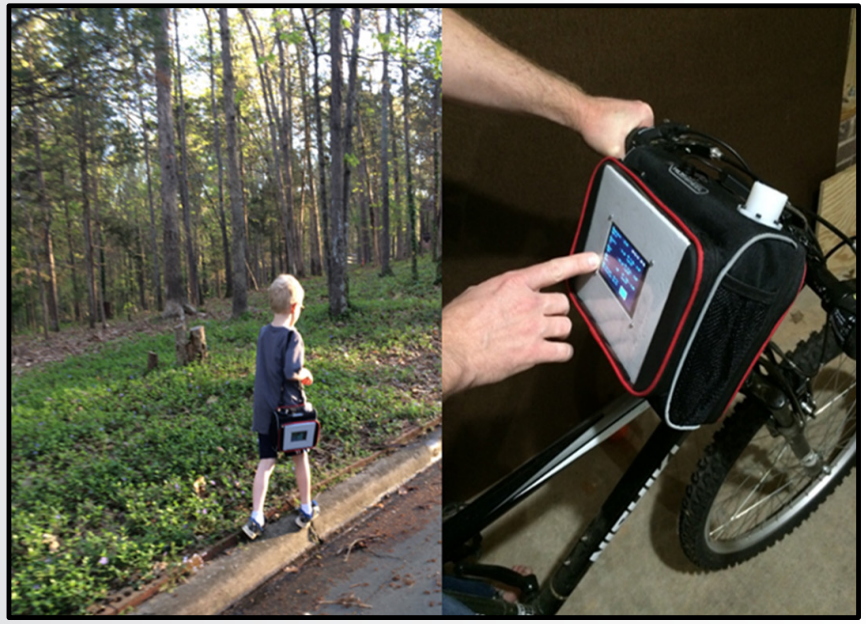
Result:

While the study found variations in local air pollution levels downwind of the railyard area, the total concentration levels measured during the study are not significantly different from those of other major urban areas in the United States.

KC TRAQS RESEARCH PROJECT

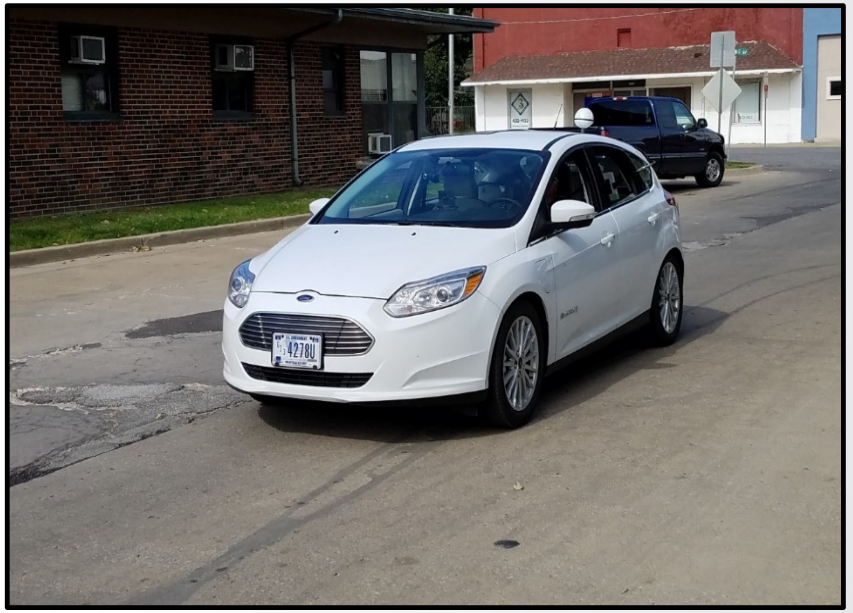
Three monitoring approaches:

Citizen Science Monitoring



Stationary Monitoring

Mobile Monitoring (GMAP Vehicle)



Fixed Site Measurements (Ongoing)

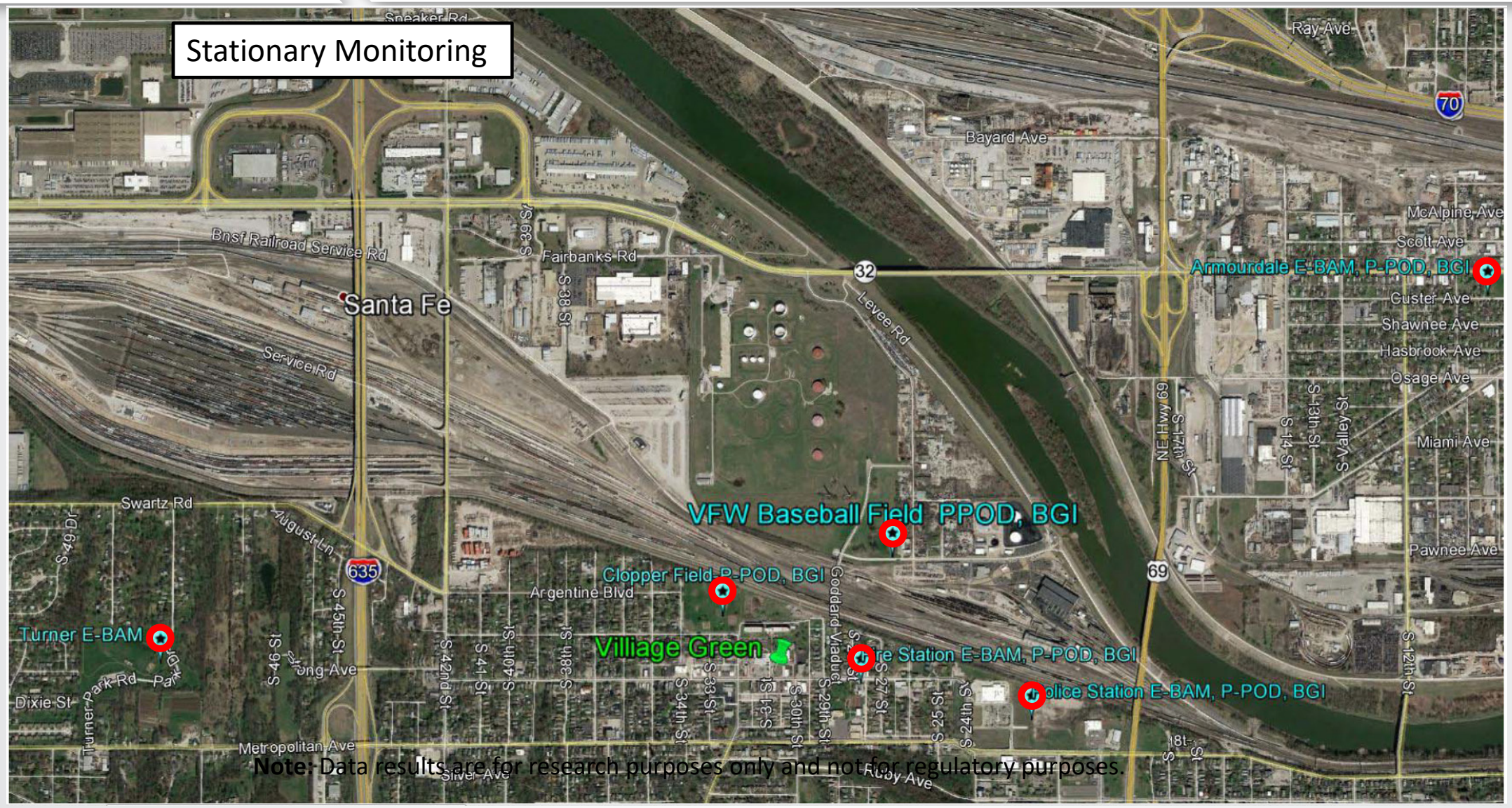
BGI PQ-200:
Integrated 24-hr. $PM_{2.5}$ filters (concentrations), Integrated 24-hr elemental carbon/organic carbon (EC/OC) filters.

MetLabs **E-BAM**:
Continuous PM2.5

P-POD (Custom Sensor Package):
Continuous $PM_{2.5}$, black carbon, wind speed, wind direction, temp/RH/BP.

Adding PurpleAir and Aeroqual AQY sensors for final 2 months

KC TRAQS Fixed Site Locations



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GMAP Deployments Completed

- **1st campaign**
  - ✓ Oct 20-Nov 3, 2017
  - ✓ Week of Nov. 12, 2017
- **2nd campaign**
  - ✓ Feb 18-Mar 3, 2018
  - ✓ Week of Mar 12, 2018

Source: Wyandotte Daily

GMAP Real-time data:

Location (GPS)
BC
PM_{10}
NO_2
CO_2
Particle count in about 80 size bins (spans ~6 nanometers – 20 µm)
Forward-facing video

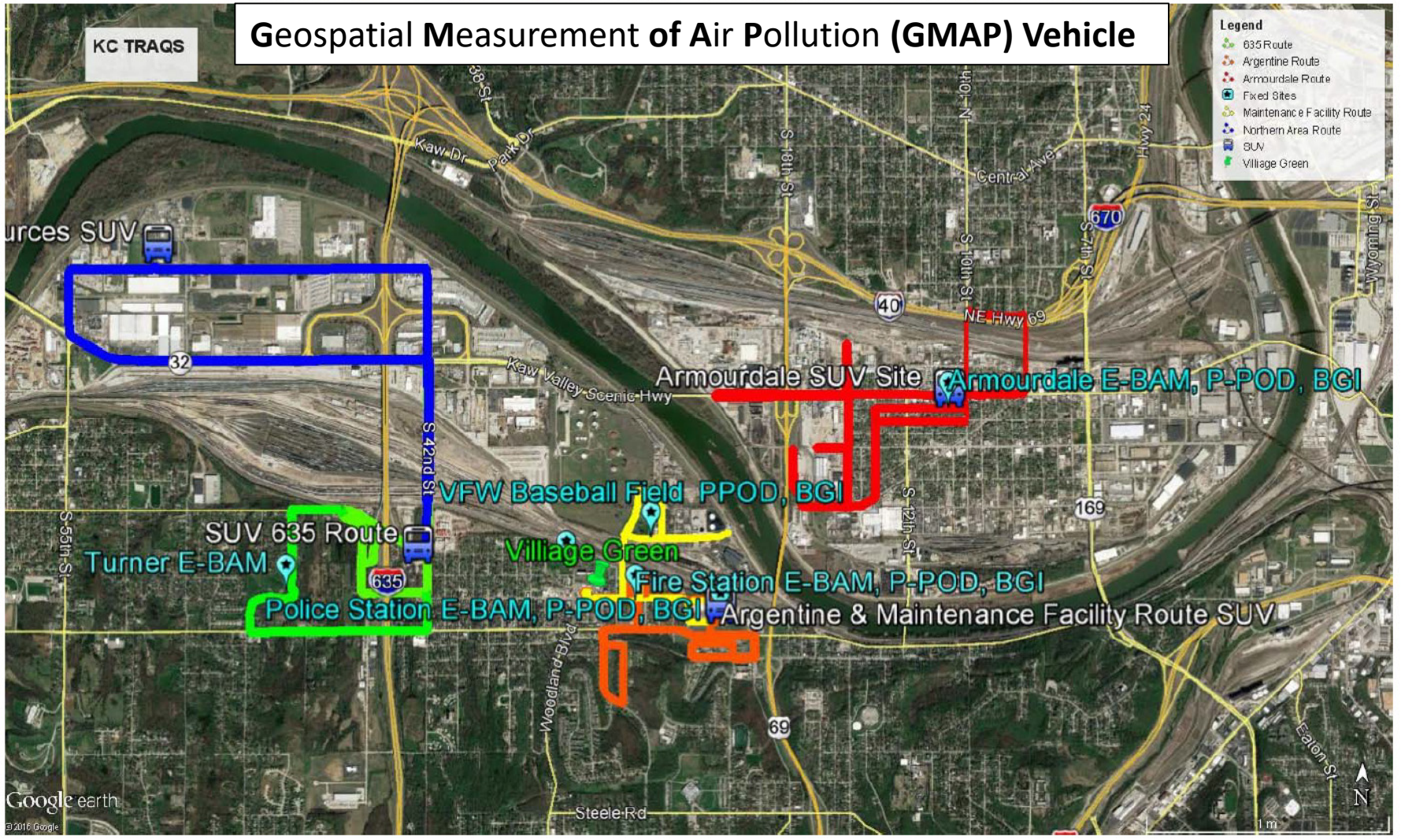
SUV (support vehicle) Priority Continuous Measurements

CO
$NO/NO_2/NO_X$
BC
UFPs
Nephelometer
Meteorology

Optional Measurements

Particle Counts
Light scattering coefficient

GMAP Deployments Completed



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Citizen Involvement

- CAT Team
  - Planning and promoting
  - Members of the community, businesses and government
- Open House
- AirMappers
  - Schools
  - Libraries

Citizen Science Monitoring

- Two Deployment Methods:
  - Schools and Groups
  - Library checkout
- Collect Data by Measurement with:
  - AirMapper, a low-cost sensor package
  - Little Training / Quick Demo of AirMapper
  - Allowing Citizen Scientist to decide where and when to sample
  - EPA collects data from units

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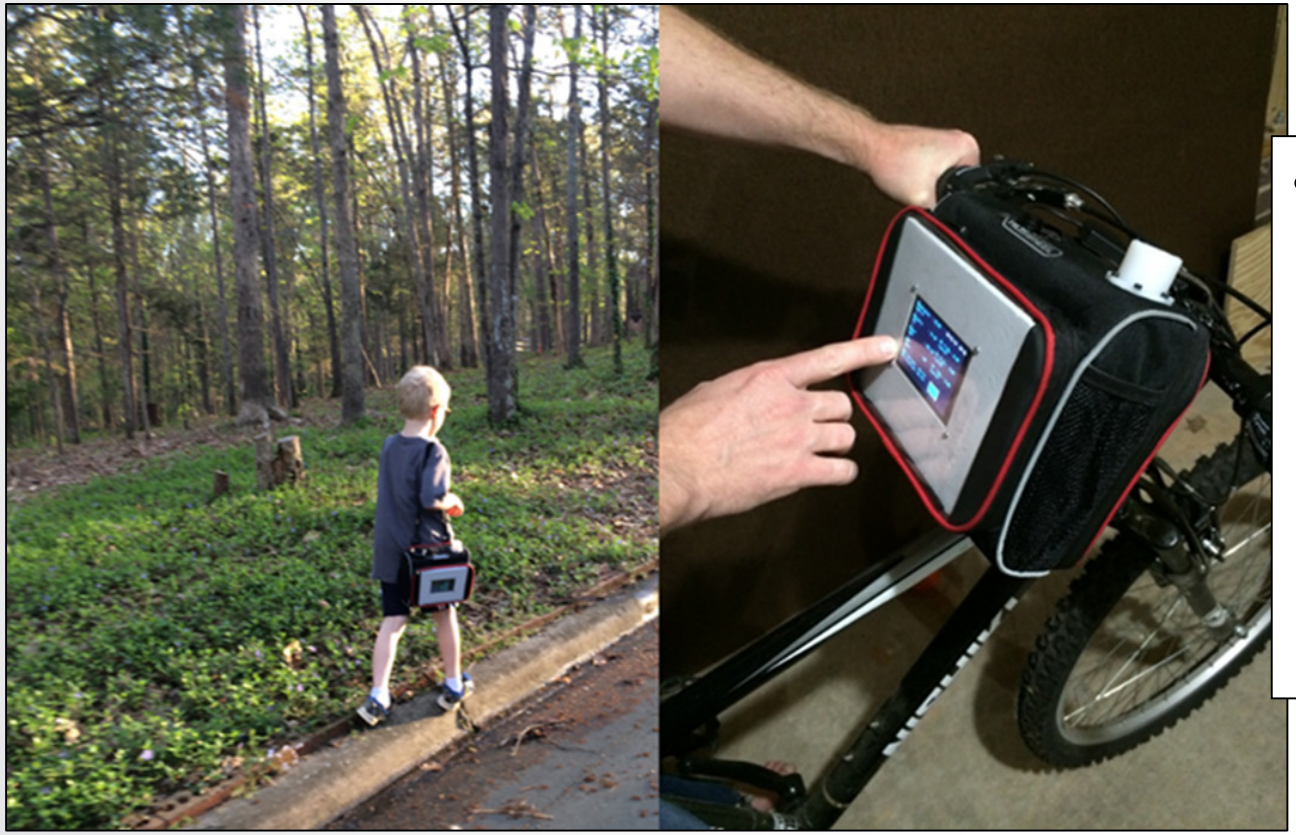
Citizen Science Monitoring



- **AirMapper monitors record**:
  - PM levels,
  - CO2,
  - latitude & longitude
  - date & time
  - noise level
  - temperature and humidity

Note: Data results are for research purposes only and not for regulatory purposes.

Citizen Science Monitoring

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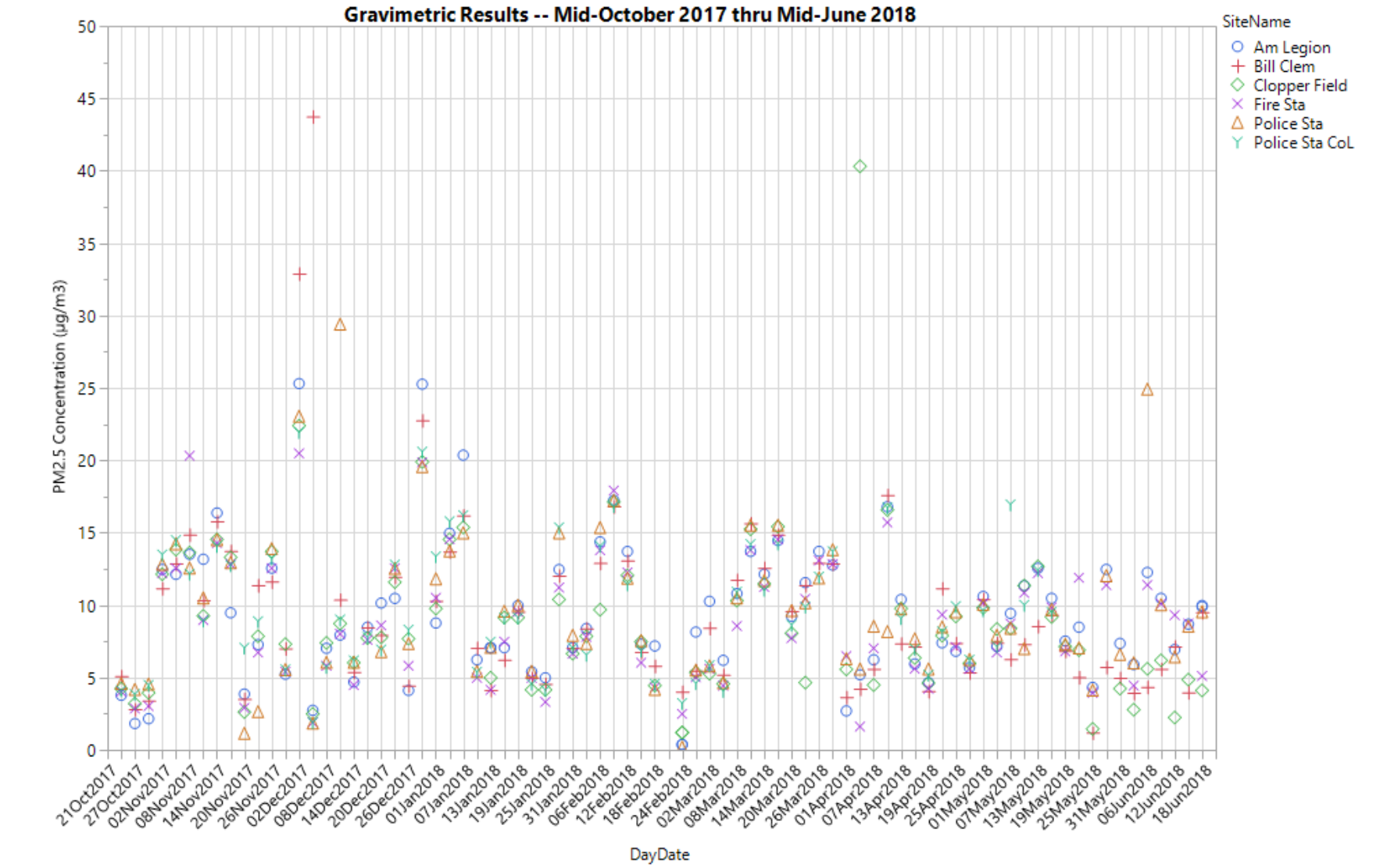
Preliminary Data

- Not Quality Assured yet
- Working on methods for AirMapper data
  - PII removal
  - Separating indoors from outdoors
  - Calibration and equipment issues
- GMAP vehicle data is still under QA review
- E-BAM data is being wrangled
- BGI PQ-200 data vs. field notes

Preliminary Data – Not Quality Assured



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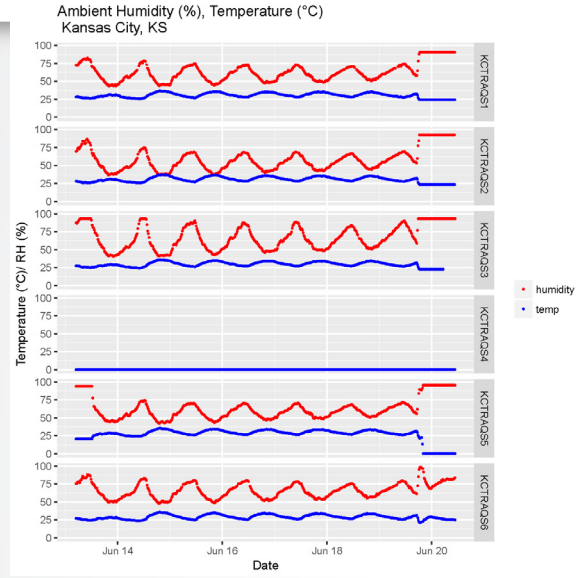

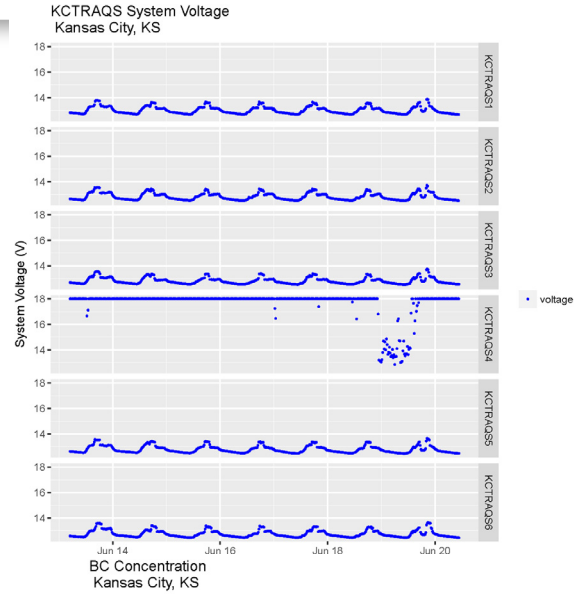

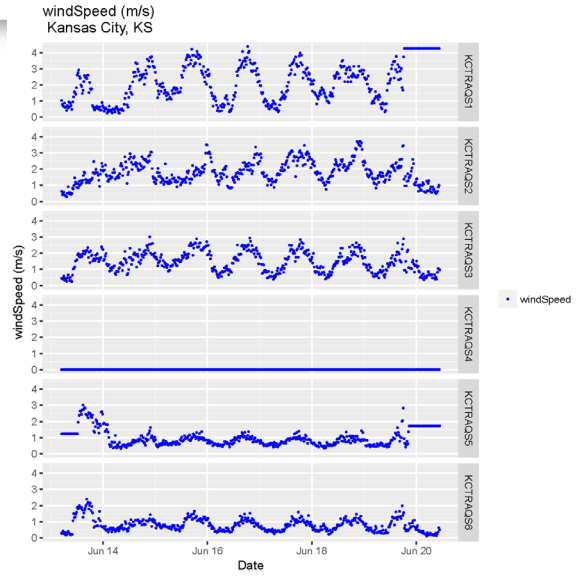

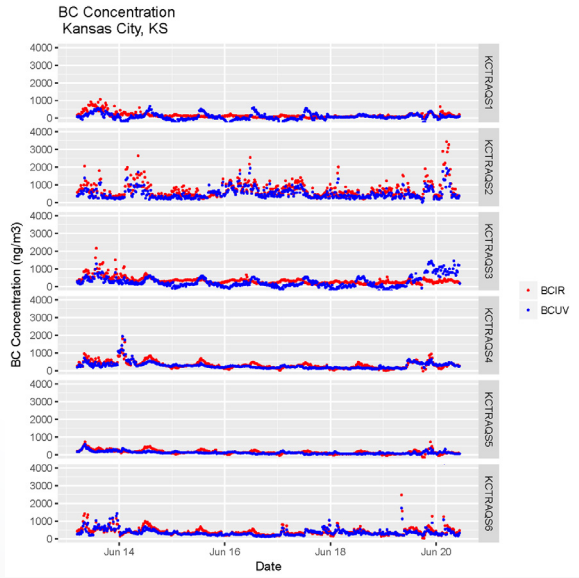

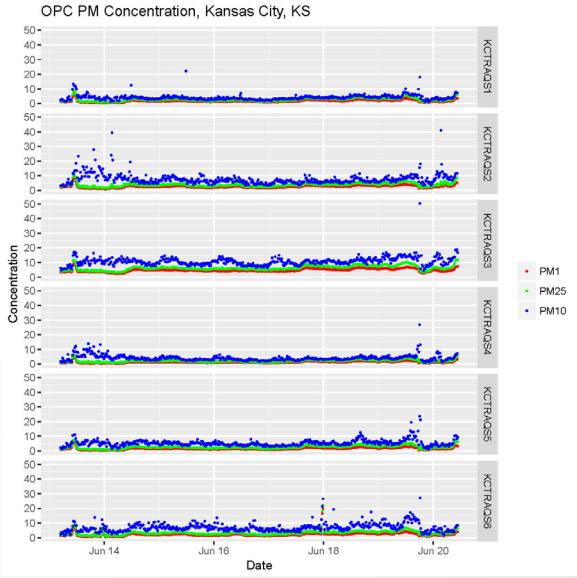

Sensor Pods – Comparison across sites.

http://www.mdpi.com/journal/ijerph/special_issues/near_source_air_pollution

KC-TRAQS Team

Sue Kimbrough, ORD Lead
Stephen Krabbe, R7 Lead
Richard Baldauf, NRMRL/OTAQ
Rachelle Duvall, NRMRL
Mike Hays, NRMRL
Pam Barfield, NRMRL
Bill Mitchell, NRMRL
Bob Wright, NRMRL
Richard Snow, NRMRL
James Faircloth, NRMRL
Chad Bailey, OTAQ

Carry Croghan, NERL
Tim Barzyk, NERL
Vlad Isakov, NERL
Mike Davis, R7
Matt Brown,R7
Cody Brown, R7
Amy Shields, R7
Amy Bhesania, R7
Amy Algoe-Eakin, R7
Andy Hawkins, R7