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Using Big Data to Characterize Urban-scale Air Quality

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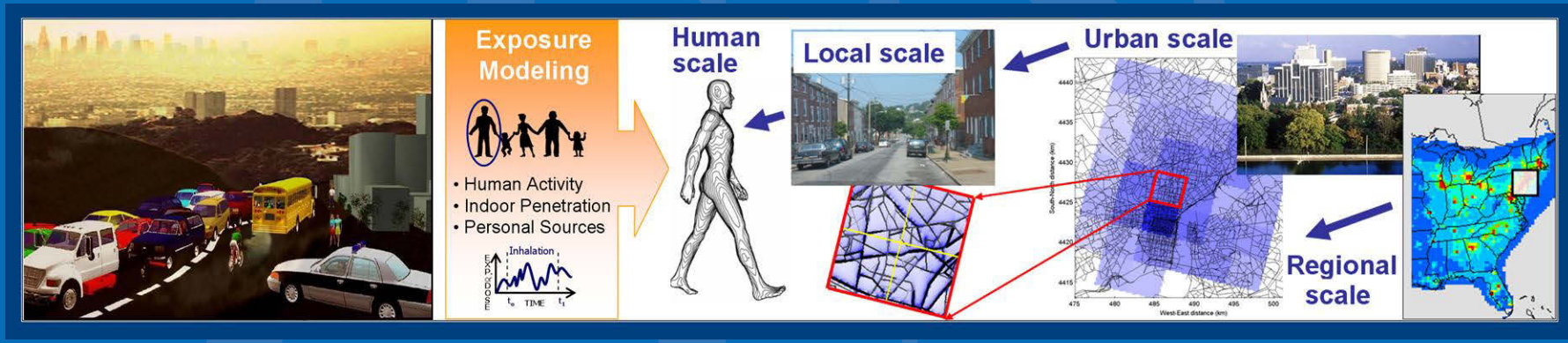

NASA Health and Air Quality Applied Science Team meeting
Pasadena, California July 10 – 12, 2019

Office of Research and Development
National Exposure Research Laboratory, Computational Exposure Division

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Motivation

- Spatially- and temporally-resolved air quality characterization is critical for community scale exposure studies and for developing future air quality mitigations
  - ✓ to identify areas with elevated levels of pollutant concentrations
  - ✓ to understand relative contributions of emissions sources
  - ✓ to develop strategies for reducing emissions and exposure
- However, there is a lack of methods and tools that can be easily applied to study near-source pollution and identify contributing sources

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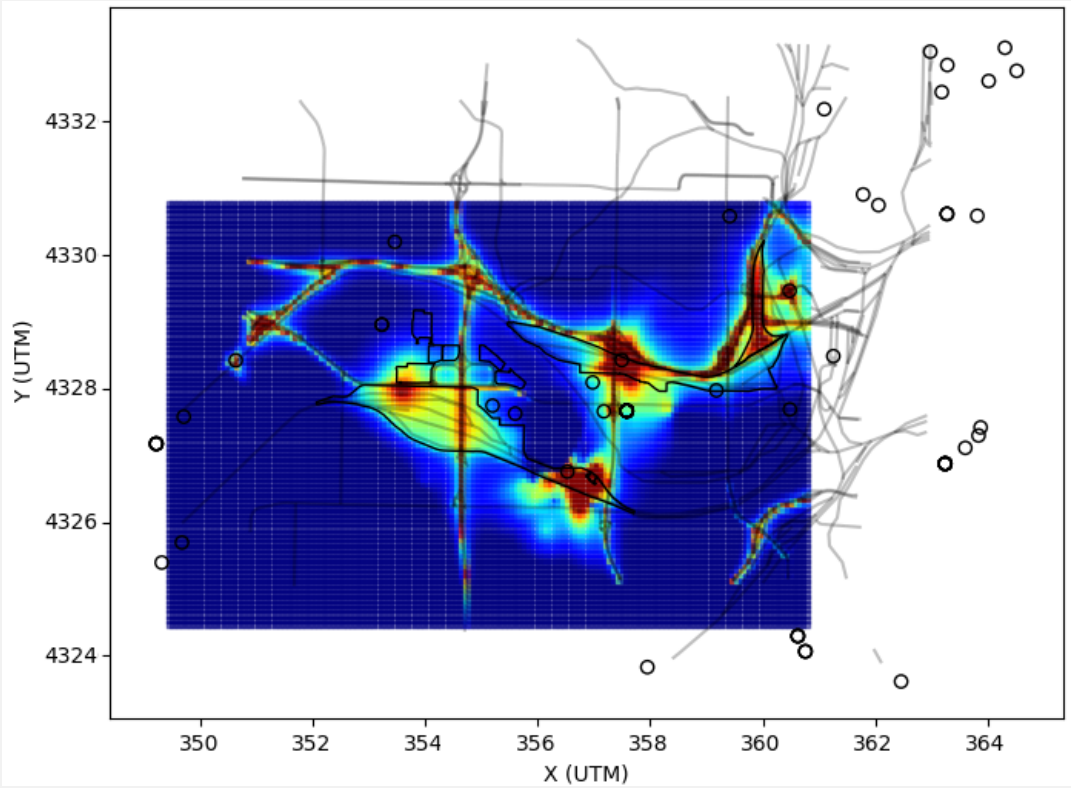
Data & Technology

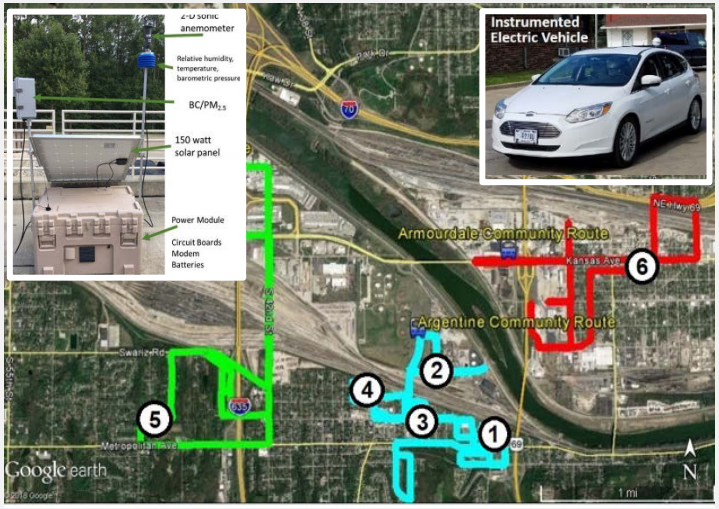
- A wide array of sensor technologies and analysis methods are available
- EPA cannot endorse a specific sensor brand, but has experience with evaluation and best practices
- Data analysis, combination and fusion methods (e.g., measurements and models) face challenges of transparency, interpretation, and communication

Data fusion method to characterize local-scale air quality

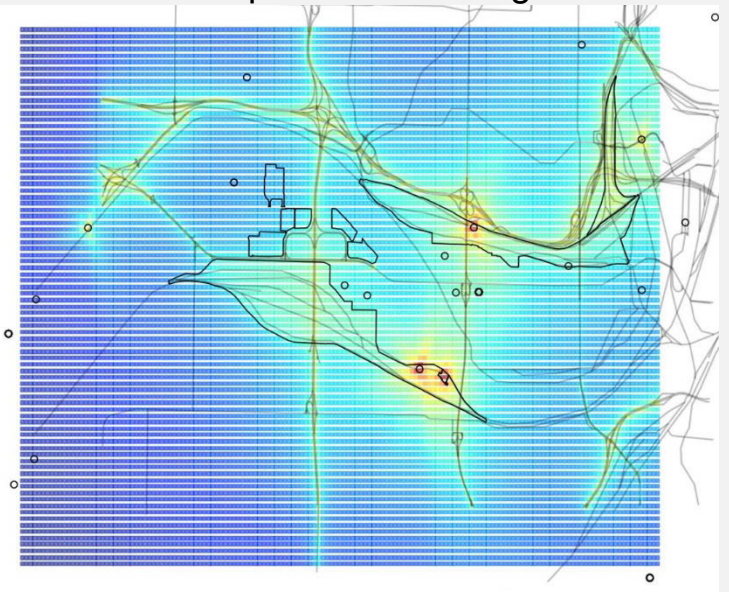
Example of application of a data fusion method[1] in Kansas using dispersion modeling and observations from KC-TRAQS[2]



Observations



Dispersion modeling



[1] using Bayesian Maximum Entropy Approach, ***The UNC-BMElab*** https://mserre.sph.unc.edu/BMElab_web/index.htm

[2] Kimbrough et al., Special Issue "Chemical Sensors for Air Quality Monitoring", *Chemosensors* **2019**, *7*(2), 26

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Future Research

- Air quality exposure studies have typically used observations or models
- Recently, there is an increased focus on using data from multiple sources, including from satellite observations
- The research would focus on determining how the satellite data could be used for characterizing air quality at fine scales
- Future research will extend the data fusion methods currently being developed to include observations from higher resolution satellite products