Using Big Data to Characterize Urban-scale Air Quality

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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
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\(^2\)

\(^1\) 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
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