Characterizing low-cost air quality sensors for a city-wide instrument

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Abstract:

The Array of Things (AoT) is a collaborative effort among leading scientists, universities, local government, and communities in Chicago to collect real-time data on the city’s environment, infrastructure, and activity for research and public use. The AoT is an urban-scale “instrument” that will enable the City, urban planners, residents, and researchers to monitor and examine Chicago’s environment, infrastructure and activity, including detecting trends and changes over time. Ultimately, the goal is to measure the city in sufficient detail to provide data to help engineers, scientists, policymakers and residents work together to make Chicago and other cities healthier, more livable and more efficient. A key component of an AoT node is the air quality board (ChemSense) with surface chemistry sensors that measure carbon monoxide, hydrogen sulphide, nitrogen dioxide, ozone and sulfur dioxide. These measurements will link human activities (for example, traffic counts) with human health and are therefore critical for achieving the AoT goal. But low-cost sensors have many limitations compared to instruments that use Federal Reference Methods (RFM) to measure air pollutants. Ultimately, the AoT air quality data will be assessed holistically, but the first step is to compare AoT results to FRM measurements. Two AoT nodes were collocated at an existing FRM EPA air quality monitoring site southeast of Midway Airport (Chicago) run by Cook County. In addition to considering bulk performance measurements (for example, the correlation coefficient), more dynamic estimates of error are explored. For example, goodness of fit between the low-cost sensors and the FRM measurements might depend on temperature, humidity and interfering gases.

Bio:

Associate professor and chair of Environmental Science & Studies at DePaul University, Dr. Mark Potosnak has degrees from Harvard and Columbia Universities, and he was a fellow in the Advanced Study Program at the National Center for Atmospheric Research. His research focuses on interactions between the plants and air quality. Specifically, he studies how trace gas emissions from plants affect atmospheric chemistry and how climate change will impact this interaction in the future. His field studies have been conducted in temperate, tropical, urban, arid and tundra ecosystems. Dr. Potosnak also deploys low-cost air quality sensors to engage citizen scientists and to explore how spatial patterns of air quality within Chicago are related to socioeconomic drivers.