Distributed in-situ measurements of PM_(2.5) in the Buzzard Point, Washington, D.C. neighborhood

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Background: Buzzard Point, DC is home to two cement factories, high-volume roadways, numerous construction and demolition sites, and two multi-purpose entertainment arenas. Residents have been complaining of low air quality for years. The one regulatory monitor installed in the neighborhood by the DC Department of Energy and the Environment (DOEE) has not shown concerning high particulate matter (PM_(2.5)) concentration when compared to annual and daily EPA standards.

Methods: To assess whether PM_(2.5) measured by the DOEE monitor is representative of the concentrations effectively experienced by Buzzard Point residents, we deployed nine PurpleAir sensors across the neighborhood between June and October 2021 and analyzed the resulting data series. These low-cost monitors have shown to be accurate when compared to regulatory measurements after applying a correction for relative humidity.

Results: PM concentrations in all of our deployment locations are well correlated with the regulatory data and are generally lower. However, we recorded a number of short-term acute exposure events from June 2021 to October 2021 where the hourly average exceeded 24 ug/m^3 for several hours. We also record one 24-hour period in which Buzzard Point residents were exposed to particulate matter concentrations above the 24-hour EPA standard.

Conclusion: Low-cost PurpleAir sensors can be deployed throughout the United States to promote environmental justice. Our work affirms that the humidity correction developed by Barkjohn et al. (2021) transforms PurpleAir data into an accurate representation of the temporal and spatial concentrations of PM_(2.5). Two recent controlled studies have found that acute short-term exposure (~ 4 -- 5 hours) to 24 and 38 ug/m3 of PM_(2.5) produced cardiopulmonary responses. Deployment of PurpleAir sensors by concerned citizens can help vulnerable communities understand their pollution exposure because local regulatory bodies have incentives to avoid placing air quality sensors in polluted areas because "discovering" a pollution hotspot could lead to penalties from federal regulators.