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Using Smart Low-Cost CO_2 Sensors in a Supplemental Network to Quantify Urban Greenhouse Gas Emissions

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Non-dispersive infrared (NDIR) sensors are a low-cost way to observe carbon dioxide mole fractions in air, but their specified accuracy and precision are not sufficient for many scientific applications. However, a previous evaluation of the SenseAir K30 carbon dioxide NDIR sensor showed that after correcting for environmental variables with coefficients determined through a multivariate linear regression analysis, the calculated difference between an individual sensor and a higher-precision instrument could have an RMSE below 2 [U+202F] ppm for 1 [U+202F] min data, demonstrating the potential to provide useful information for ambient air monitoring. Additional work has been done on evaluating additional sensors of varying cost and specifications. These sensors could then be deployed in sufficiently large (∼100+) quantities as either a standalone observing network, or to increase spatial density to an existing high-accuracy network, to detect localized sources and sinks. This additional amount of data could then be used in atmospheric inversions to estimate flux from an area, or to better constrain forward-transport models that predict CO_2 mole fractions through advanced data assimilation techniques. Field results will be shown from Baltimore-Washington and Beijing metropolitan regions.