The North-East Corridor: Baltimore-Washington DC Urban Greenhouse Gas Network

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Global trends in urbanization have focused carbon cycle community interest on urban emissions, leading to many recent studies on greenhouse gas (GHG) emissions from cities. Many efforts to quantify urban emissions have focused on establishing long-term, relatively dense networks of tower or roof-based continuous in-situ trace gas observations. The North-East Corridor: Baltimore/Washington DC (NEC-BW) project is one such effort, a partnership between the National Institute of Standards and Technology (NIST), Earth Networks, University of Maryland, NOAA, and Arizona State University to estimate and determine trends in CO_2 and CH_4 emissions from the cities of Washington, DC and Baltimore, MD, USA. The project incorporates high-resolution emissions modeling (Hestia), tower-based in-situ and flask-based trace gas observations, aircraft-based observations from periodic intensive campaigns (Fluxes of Atmospheric Greenhouse Gases in Maryland, FLAGG-MD), low-cost sensor testing and deployment, and meteorological and statistical modeling. A goal of the project is to develop new and evaluate existing techniques for flux estimation at the urban scale, with an aim toward documentation and standardization of such methods.

Here we introduce the NEC-BW tower network, with continuous in-situ measurements of CO_2 and CH_4 made using an observing system based on high-precision CRDS analyzers. The network was designed to maximize the effectiveness of the observations in constraining urban emissions in the NEC-BW and characterize incoming air masses. As the network has come online, we have applied quality-control and data processing methods for all the in-situ tower-based observations, and have developed an algorithm for calculating the uncertainty of those observations (Verhulst et al., 2016). We will present the calibration method and uncertainty calculation for the network data, as well as initial analyses of the time series of observations from the established tower network sites. We show seasonal differences in the diurnal cycle in CO_2 and CH_4, and the variability across the rural-urban gradient. Lastly, for some of the longer-running regional sites, we document the seasonal cycle by subtracting the global trends in CO_2 and CH_4.

References

K.R. Verhulst et al., "Carbon Dioxide and Methane Measurements from the Los Angeles Megacity Carbon Project: 1. Calibration, Urban Enhancements, and Uncertainty Estimates." Atmos. Chem. Phys. Discuss. **2016,** 10.5194/acp-2016-850, 2016.