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Application of a Spatially Explicit Scaling Factor Method on CO_2 Emissions From New York

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Assessing progress towards greenhouse gas mitigation targets in recent legislation requires reliable, precise methods for emissions quantification. Top-down approaches can provide a complementary assessment to the bottom-up inventories typically used by cities.

In this work we have performed a series of 9 winter aircraft measurement flights downwind of New York City in 2018 – 2020. We use dispersion modeling driven by publicly available meteorological products to calculate footprints relevant to the flight data. To calculate modeled emissions, we combine these footprints with four CO_2 inventories (ODIAC, EDGAR, ACES, and Vulcan) using a spatially explicit scaling factor approach. We show that we can isolate the emissions from two areas of interest, New York City and the New York-Newark urban area, by using the fraction of modeled enhancements originating in said areas of interest as weighting functions. We then calculate a scaling factor that optimizes agreement with measurements for each flight. Here we discuss this technique and the posterior emissions for both areas of interest as compared to inversion analyses for the same areas. We also quantify the variability across the ensemble including multiple meteorological products, scaling factor calculation methods, and mixing parameterizations across all inventories and flight days.