EGU21-13828
https://doi.org/10.5194/egusphere-egu21-13828
EGU General Assembly 2021

Development of a high-resolution prior for inverse modelling of New York City methane emissions

Joseph Pitt[1], Israel Lopez-Coto[2], Kris Hajny[1,3], Jay Tomlin[3], Robert Kaeser[3], Thilina Jayarathne[3], Brian Stirm[4], Cody Floerchinger[5], Chris Loughner[6], Róisín Commane[7], Conor Gately[8], Lucy Hutyra[9], Kevin Gurney[10], Geoffrey Roest[10], Jianming Liang[11], Anna Karion[2], James Whetstone[2], and Paul Shepson[1,3]

[1]School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY, US (joseph.pitt@stonybrook.edu)
[2]National Institute of Standards and Technology, Gaithersburg, MD, US
[3]Department of Chemistry, Purdue University, West Lafayette, IN, US
[4]School of Aviation and Transportation Technology, Purdue University, West Lafayette, IN, US
[5]Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA, US
[6]Air Resources Laboratory, NOAA, College Park, MD, US
[7]Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY, US
[8]Metropolitan Area Planning Council, Boston, MA, US
[9]Department of Earth and Environment, Boston University, Boston, MA, US
[10]School of Informatics, Computing and Cyber Systems, Northern Arizona University, Flagstaff, AZ, US
[11]Environmental Systems Research Institute, Redlands, CA, US

Recent studies have shown that methane emissions are underestimated by inventories in many US urban areas. This has important implications for climate change mitigation policy at the city, state and national level. Uncertainty in both the spatial distribution and sectoral allocation of urban emissions can limit the ability of policy makers to develop well-targeted emission reductions strategies. Top-down emission estimates based on atmospheric greenhouse gas measurements can help to improve inventories and better inform policy decisions.

This presentation builds on previous work estimating methane emissions from New York City and the wider urban area based on measurements taken during nine research flights. We used an ensemble of dispersion model runs in a Bayesian inverse modelling framework to derive posterior emission estimates. Prior emissions were taken from three coarse-resolution inventories based on spatially disaggregated national totals. The most recent version of EDGAR (v5) and the gridded EPA inventory both required upscaling by more than a factor of two to be consistent with our measurements.

Here, we construct a high-resolution methane emission prior using a combination of spatial proxies and reported emissions for various sectors. We present preliminary results evaluating the ability of this new prior to represent the magnitude and spatial distribution of emissions, through comparison with both the measured data and results obtained using coarser resolution inventories.