5.081 Designing an optimal observation network for monitoring carbon dioxide (CO2) emissions from megacity Osaka.

Early Career Scientist

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Abstract:

Cities are responsible for more than 70% of global greenhouse gases (GHGs) emissions. The Paris Agreement recognizes their key role in combating climate change. Many of global cities have signed up for local climate actions (e.g. Global Covenant of Mayors) and set their own emission reduction targets. Several cities have started compiling their emission inventories to monitor their progress: However, achieving robust emission estimates at a subnational level is a real challenging due to technical difficulties. The science community has been examining the use of atmospheric measurements to directly quantify emissions in order to support GHG emission management.
We as a team local at Osaka, have been prototyping a science-based framework to support emission management for megacity Osaka (population: 2.7 million). We have

developed a multi-resolution, spatially-explicit carbon dioxide (CO_2) emission inventory framework in order to better quantify Osaka emissions with an updated information. Compared to an existing 1km emission inventory for Japan, we confirmed shifts in major emission hotspots that are largely attributable to our unique emission disaggregation with detailed source geolocation and census-block level geographic data. Given the lack of operational ground-based atmospheric CO_2 observation in the Osaka area, we are currently developing an observation system simulation experiment capability to study an optimal observation network for emission monitoring.

We have completed an evaluation of the meteorology simulated with the WRF-Chem model and started simulating atmospheric CO_2 with our emission inventory. We will present simulations of observation system sensitivities (in situ and satellites) to arbitrary, but yet realistic emission changes (e.g. 30% emission reduction) and discuss future possibilities for Osaka observation network under a certain budget constraint.