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Megacity Carbon: Observing system study for tracking Los Angeles greenhouse gas emission trends

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Future greenhouse gas (GHG) mitigation agreements will require independent quantification of anthropogenic emission trends. Atmospheric observations contain information about true and total GHG emissions, and therefore provide a foundation for monitoring, verifying, and validating anthropogenic GHG emissions. Atmospheric observations also are strongly influenced by biospheric fluxes, presenting a challenge for disentanglement and attribution. Megacities provide an optimal target for atmospheric monitoring of human-derived emissions. Intense anthropogenic emissions are concentrated in small spatial areas, creating a strong and detectable local signal, facilitating observation and attribution. The Megacity Carbon project aims to capitalize on these strong signals, by developing and demonstrating atmospheric observing systems to track GHG emission trends. To quantitatively track emission changes with time, we must carefully consider observing network design. Here we present a modeling study of different observing systems in the Los Angeles basin. By using a high-resolution Lagrangian Particle Dispersion model, we test different observations sensitivity to emissions in the basin. We employ a Bayesian approach to quantitatively assess the performance of different network designs, and explore the strengths and weaknesses of different observing techniques (ie in-situ point vs. total column observations). We'll present a recommended network design for Los Angeles, and a recommended method to design observing systems in other Megacities.