

**Title: The Megacities Carbon Project**

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**Session IIIa: Megacities and Metrology Needs for Supporting Greenhouse Gas Mitigation- Urban Greenhouse Domes**

**Abstract:**

Anthropogenic carbon emissions from cities and the demands they place on broader infrastructure represent the single largest human contribution to climate change. Many small areas with large fossil-fuel CO<sub>2</sub> and CH<sub>4</sub> fluxes are undergoing rapid change due to development, urbanization, energy sector transformations and/or climate mitigation actions. Meanwhile, flux estimation uncertainties at these finer spatial scales remain significantly larger than those at the continental and national scales addressed by traditional carbon estimation techniques. Improved quantification and understanding of underlying processes at the urban scale will not only provide policy-relevant information and improve the understanding of urban dynamics and future scenarios, but will translate into better global-scale anthropogenic flux estimates, and advance our understanding of carbon cycle and climate feedbacks across multiple scales. An observing system including a tiered set of surface, airborne, and satellite sensors can be focused spatially and sectorally to address these challenges. A thoughtfully crafted research program that is grounded in sustained, dense observations relevant to estimating urban carbon fluxes and their controlling processes and is focused on a statistically significant sample of cities will advance our understanding of the carbon cycle and support decision making. We describe the Megacities Carbon Project in Los Angeles as an example for developing and validating the integrated application of atmospheric observations from localized surface networks, aircraft campaigns, and satellites with an analytical construct for linking atmospheric information with the human activities that drive emissions. We present examples of preliminary observations from surface and satellite assets, space-time resolved emission data sets and describe challenges and future plans.