**Improving and Assessing Aircraft-based Greenhouse Gas Emission Rate Measurements for the City of Indianapolis (INFLUX Project)**

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To achieve current greenhouse gas reduction targets established in the U.S. and elsewhere, coherent and effective strategies in mitigating atmospheric carbon emissions must be implemented in the next decades. A challenge of such targets is the ability to ensure that emissions are “measurable”, “reportable” and “verifiable”, and mitigation efforts accurately quantifiable. Approaches to manage greenhouse gas emissions must focus on urban environments since ~74% of carbon dioxide ($CO_2$) emissions worldwide will be from cities and emissions measurement uncertainties still are significantly high (~50% to >100%). The Indianapolis Flux Experiment project (INFLUX) was established to develop, assess and improve top-down and bottom-up quantifications of urban greenhouse gas emissions. Based on an aircraft mass balance approach, we performed a series of experiments focused on the improvement of $CO_2$, methane ($CH_4$) and carbon monoxide (CO) emission rates quantification from Indianapolis. We designed a series of mass balance experiments (MBEs) based on multiple-downwind transects. We flew at two 5km-separated downwind distances at different altitudes spanning the depth of the boundary layer, and then calculate the difference in the two flux determinations as a measure of the method precision. We also conducted 10 methodologically identical MBEs in a short period of time (24 days, one downwind distance) for assumed constant total emission rate conditions, as a means to obtain an improved standard deviation of the mean determination. All these efforts aim to better understand the efficacy of aircraft top-down approaches in measuring carbon emissions from urban environments. Our final objective is to drastically improve the method overall uncertainty from the previous estimate of 50%.

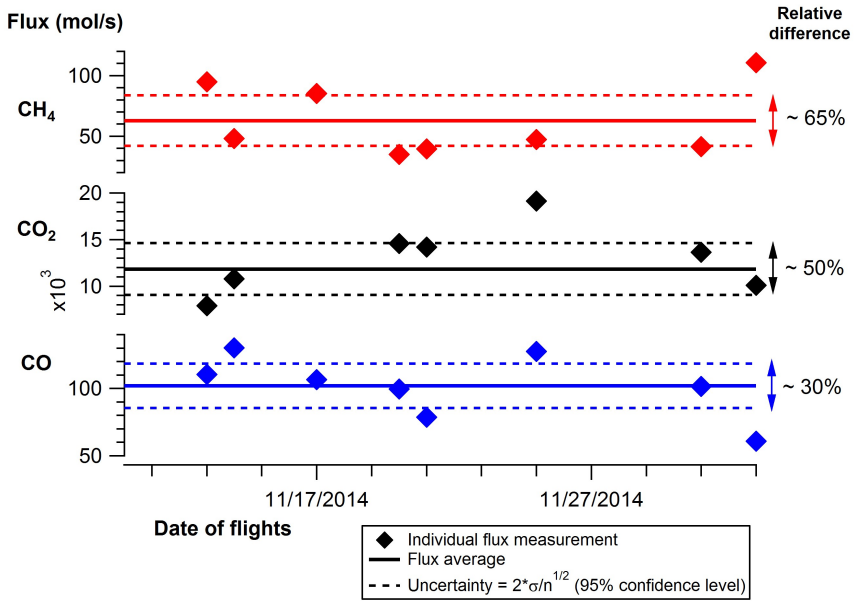


**Figure 1.** Preliminary results of emission rates (in mol/s) of $CO_2$ (blue), $CH_4$ (red) and CO (black) from eight mass balance experiments (as part of the 10 MBEs) performed downwind the city of Indianapolis in November-December 2014.