New approach to characterize CO2 (and CH4) emission over Sacramento in California using an airborne aircraft measurement.

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CO2 and CH4 emission over the Sacramento in California is estimated through using airborne aircraft (through Alpha Jet Atmospheric eXperiment) equipped with greenhouse gas sensors. To better quantify the emission rate over the entire city, we designed the cylindrical flight patterns over the city and used kriggine method to fill the gaps which were not capture by the observation. Based on Gauss’s divergence theorem, the emission rates were measured from 4 flights throughout seasons. Mean emission rates of CO2 (CH4) was XX+/- g/s. No significant variability in emission rates was detected among 4 flights and different seasons. However, the Plumes show high spatial variability in the horizontal and vertical domain, so that the fluxes estimations are highly affected by the wind direction. Considering the high spatiotemporal variability of emission rates, the individual measurement taken over the short durations should be used with caution, although the fluxed calculated at the downwind side of the Sacramento shows the persistent pattern and the magnitude. The local emission rates was 2-3 times higher than the entire city-size emission rates, suggesting the contribution of local source in CO2 and CH4 enhancement can be dominant. Generally, our results demonstrate the new approach for capturing city-size emission rates and its advantages and challenges for estimating the greenhouse gas emission and its source.