Unexpected and Significant Biospheric CO_2 Fluxes in the Los Angeles Basin Indicated by Atmospheric Radiocarbon

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It is normally assumed that emissions and concentrations of carbon dioxide (CO_2) in and around cities are dominated by fossil fuel-combustion. This is surprisingly not the case for Los Angeles, despite its naturally dry climate. Measurements of atmospheric carbon-14 dioxide ($^{14}CO_2$), the gold standard for identifying fossil fuel emissions in the atmosphere, quantify not only the influence of fossil fuel combustion but, by residual, the biospheric contribution as well. Here we report results from an air sampling network for CO_2 and radiocarbon (^{14}C) measurements within the Los Angeles monitoring network. Unexpectedly, mid-day CO_2 enhancements above background at our three sites in Los Angeles are very high, averaging 16 ppm. However, our analysis using radiocarbon reveals that only ~75% of the enhancement resulted from fossil fuel combustion. The remaining 25% comes from biospheric sources. We will quantify the contributions of possible sources to this unexpectedly large biospheric contribution. Moreover, the biospheric component of the Los Angeles CO_2 signal exhibits seasonal behavior with net uptake of carbon in mid-summer, suggesting a substantial role for managed urban ecosystems. Finally, we will discuss the implications of these results for urban fossil fuel emissions monitoring using surface and space-based approaches.

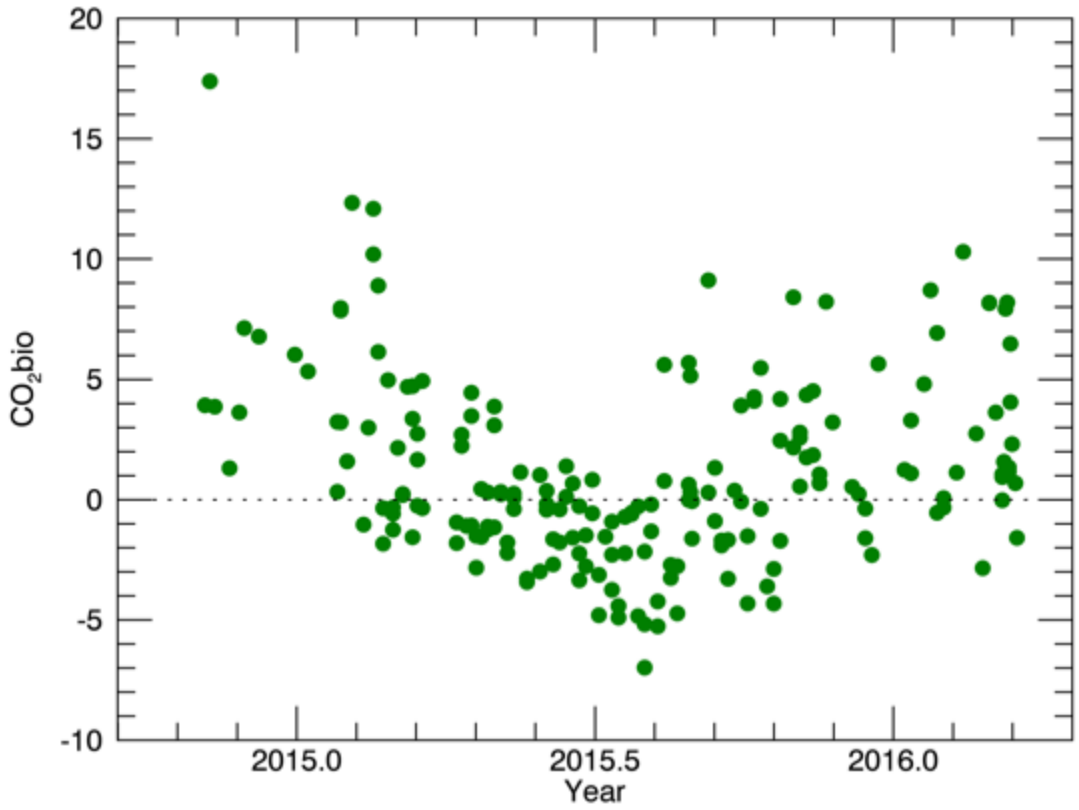

Figure 1. Time series of biospheric enhancements (or drawdown, negative) relative to background concentrations for three sites in the Los Angeles Basin: U. of Southern California, Granada Hills, and Cal. State Fullerton. Summertime CO_2 uptake and wintertime release are evident.