Stable Isotopes of Carbon Monoxide during Two Summers at Indianapolis, IN show Significant Influence of Oxidized Biogenic Volatile Organic Compounds on the CO Budget

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We present carbon monoxide (CO) stable isotopic results from two summers at Indianapolis, as part of the Indianapolis FLUX project (INFLUX). One of the goals of INFLUX is to learn more about the CO budget in urban areas, with particular focus on how CO relates to fossil fuel produced carbon dioxide (CO_{2ff}). CO_{2ff} can be explicitly determined by radiocarbon measurements, but these measurements are too expensive to make at high resolution. CO has been explored as a potential urban tracer for CO_{2ff} and has shown promise during the winter months at Indianapolis. However, during the summer months, this relationship breaks down, suggesting non-fossil fuel sources of CO. Here, we use stable isotopes of CO to partition the various sources of CO within the city.

Our results suggest during the summer months around 46% of the CO enhancements (on average) within Indianapolis are due to oxidized volatile organic compounds (VOC's). While our results do not provide information about the exact species of VOC responsible for this large increase, previous work done by numerous groups suggests that isoprene may be the largest, and most likely, source of these summertime CO enhancements within the city. We compare this result to a Congestion Mitigation and Air Quality (CMAQ) chemistry model output for July in Indianapolis, and find reasonable agreement.

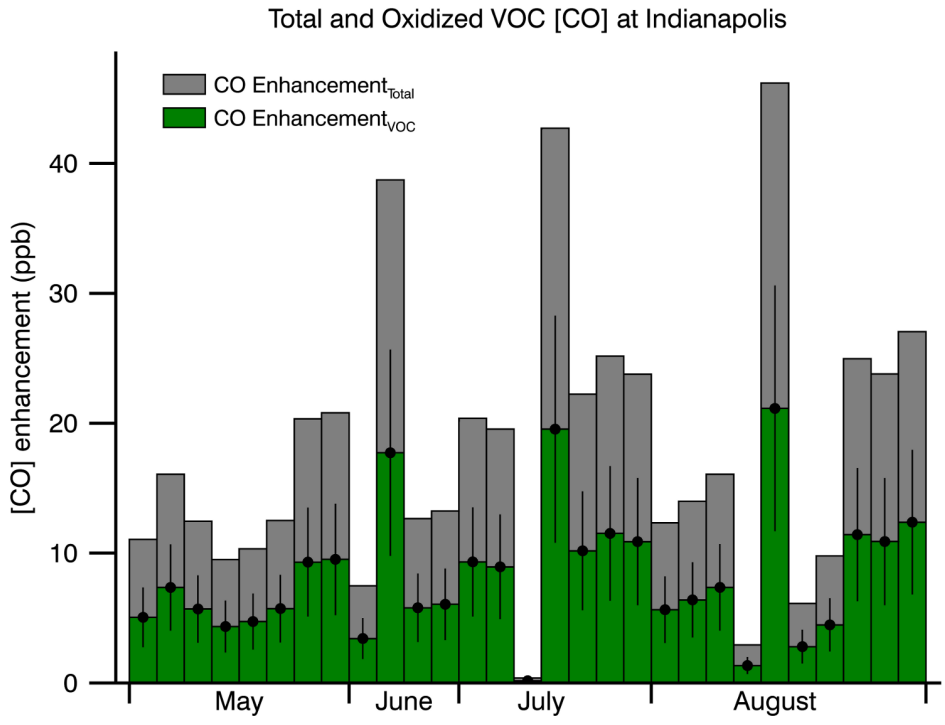

Figure 1. CO enhancements at a tall tower in Indianapolis, IN for the measurements used in this study. Total CO enhancement is shown in grey, and the calculated mean VOC enhancement is overlaid in green. Error bars are 1s of the estimated VOC enhancement.