

A Multi-species Analysis of Carbon Enhancements during the ACT-America Campaign

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While the global carbon cycle is relatively well-constrained, diagnosing carbon sources and sinks on regional scales is complicated by sparse atmospheric observations, uncertainties in regional transport, and uncertainties in upwind boundary conditions. The Atmospheric Carbon and Transport - America (ACT-America) campaign is focused on reducing these uncertainties in regional inversions through broadly surveying the emissions and transport of carbon dioxide (CO_2) and methane (CH_4) in three eastern U.S. regions. As part of ACT-America, ESRL/GMD flask samples are analyzed for greenhouse and trace gases, including isotopic ratios of CO_2 and CH_4 . These discrete flask measurements can approximate background greenhouse gas abundances and help to characterize sources of regional carbon enhancements above background levels when combined with back trajectory and footprint analyses. We present an overview on the use of flask sample species, including non-methane hydrocarbons, methyl halides, and delta carbon-14 dioxide ($\Delta^{14}\text{CO}_2$), for source characterization and background level determination during ACT-America, and comparisons to the ESRL/GMD Carbon Cycle and Greenhouse Gas aircraft network.

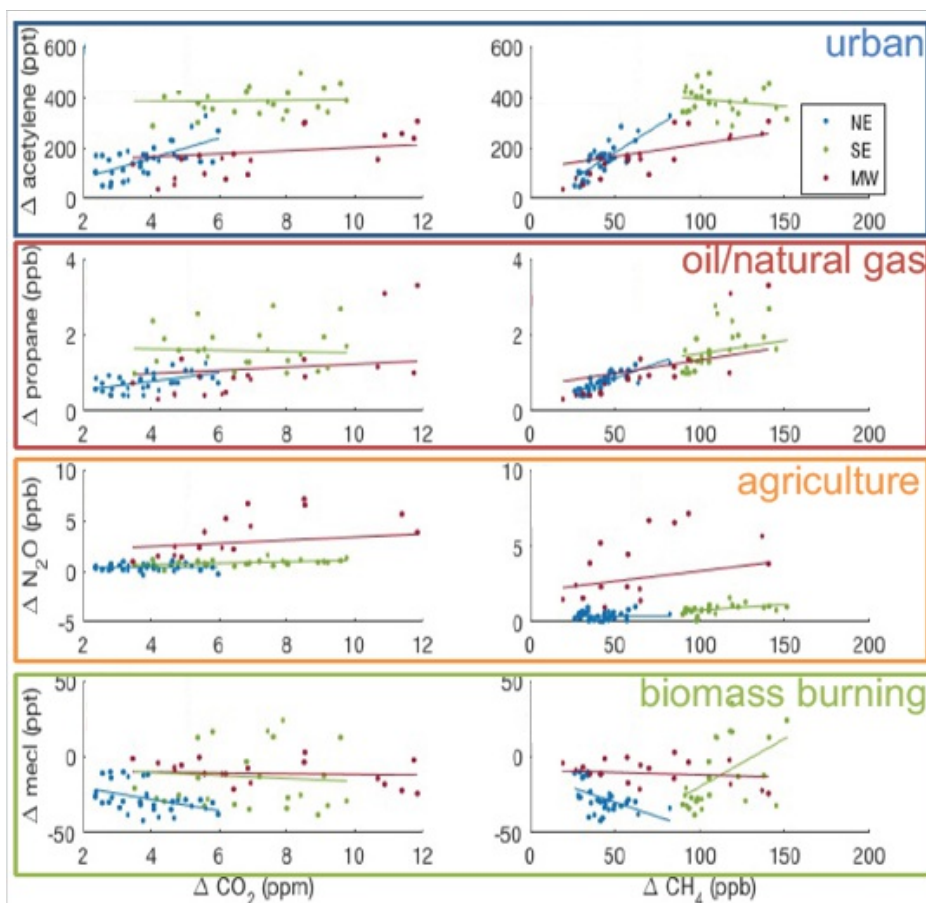


Figure 1. Multi-species correlations between flask tracer species and carbon enhancements in each of the three ACT-America regions, demonstrating the use of additional tracers for emissions characterization.