Regional Carbon Cycle and Atmospheric Inversions in the SouthEastern (SE) United States (U.S.) – Optimizing an Observational Network

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The earth's terrestrial biosphere has been a strong net sink of atmospheric CO_2 for roughly three decades, substantially slowing the rate of accumulation of CO_2 in the atmosphere due to combustion of fossil fuels. The causes of this net sink and its likely evolution in the future, however, both remain quite uncertain, yielding substantial uncertainty in our projections of future climate. Understanding the terrestrial carbon cycle remains a high priority for understanding climate change and is of great importance in the SE U.S. in part because terrestrial biosphere models have shown that the largest uncertainty in simulated Net Ecosystem Productivity (NEP) of CO_2 in North America to be in the SE U.S. The region is a dynamic and relatively poorly constrained contributor to the terrestrial carbon balance of North America. Furthermore, the forests of the SE U.S. are important for the North American carbon balance because they are one of the most productive biomes on the continent, have large biological fluxes, and are sensitive to climate change.

The Gulf Coast Intensive (GCI) Project seeks to apply recent advances in atmospheric inversion methodology and observational technology to study the carbon balance of North America as a whole with special emphasis, including new terrestrial inventory assessments, on the dynamic and relatively understudied SE U.S. This poster focuses on designing an optimal observation strategy that minimizes anthropogenic influences (e.g., power plants) while maximizing the data impact of each site. Factors that were taken into consideration were existing observations, land coverage, NEP, fossil fuel emission estimates from Vulcan, and large emission sources such as power plants. In addition, we will present an analysis of seasonal and synoptic gradients in CO_2 mixing ratios across North America using the existing relatively dense CO_2 measurement network. Five different regions were identified (East, Southeast, Mid-Continent, Northwest, and West) based on similarities in CO_2 seasonal cycle and differences will be discussed.

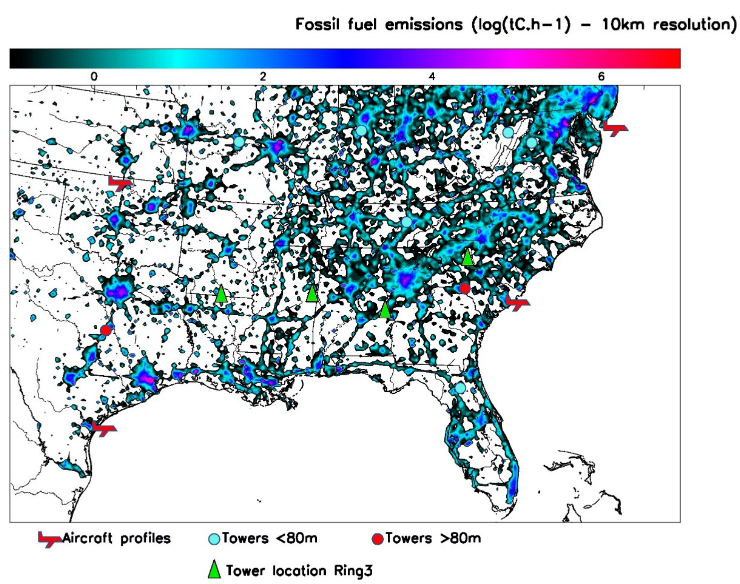

Figure 1. Vulcan fossil fuel emissions for the SE U.S. Existing towers are shown as aqua and red circles, and potential tower locations for the GCI are shown as green triangles.