A recently compiled global, monthly, fossil-fuel, carbon dioxide inventory (CO₂) (Andres et al., 2011) allows for a reexamination of the contribution of fossil fuels to the seasonal cycle observed in atmospheric CO₂ concentrations. Previous analysis (e.g., Heimann et al., 1989) revealed a site-specific role for fossil fuel CO₂ based upon the seasonal cycle determined by Rotty (1987). This study begins with a much more detailed and rigorous analysis of the fossil fuel seasonal cycle than available to Rotty (1987).

The global, monthly, fossil-fuel, CO₂ inventory serves as one input into an atmospheric general circulation model (AGCM) based chemistry-transport model (ACTM). The inquiry centers on if fossil fuel emissions significantly impact the seasonal cycle of measured atmospheric CO₂ concentrations. Model results are compared to Scripps Institution of Oceanography (SIO) flask and continuous analyzer data. Primary metrics used in the comparison are slope and correlation analyses. Slope analysis helps assess the degree to which model and SIO data agree. Correlation analysis helps assess the degree to which the various model components (i.e., fossil fuels, terrestrial biosphere, oceans) contribute to the overall seasonal cycle.

Preliminary results (for Northern Hemisphere sites) indicate: 1) good agreement between model output and SIO observations for total CO₂, and 2) the annual cycle of total CO₂ concentrations is most heavily influenced by the terrestrial biosphere, fossil fuel emissions contribute about 10% to the seasonal cycle amplitude, and oceanic emissions are negatively correlated to the seasonal cycle amplitude. We expect to have more results by the time of IUGG.