**Biological Controls of Terrestrial Carbon Fluxes**

NSF

2003-2006

We have developed and tested a set of atmospheric inverse methods for estimation of the regional exchange of CO2 with the land surface (from the “top down”) and modeling the linkage of biophysics, biogeochemistry, meteorological, and atmospheric transport processes to be tested against various observables (from the “bottom up”). The methods we have developed are also applicable to other carbon cycle models and to new data sources (e.g., COBRA, and measurements made under the North American Carbon Program).

All of the work described in this section has been performed with support from other agencies in addition to the relatively modest contribution from NSF-IRC (including US DoE/NIGEC, DoE/TECO, NASA, and NOAA).

Major research activities included:

1)  development of a method for quantitative estimation of regional surface CO2 exchange and its uncertainty from continuous atmospheric [CO2] measurements;

2)  investigation of information content in eddy correlation timeseries and consequent ability to quantify physiological parameters in a spatially- explicit regional carbon cycle model (SiB2);

3)  quantification of time-varying uncertainty in simulated fluxes of heat, water, and carbon on hourly and seasonal time scales that results from uncertainty in ecophysiological parameters;

coupling of a numerical model of ecosystem physiology (SiB2) to a mesoscale model of weather and atmospheric CO2;

5)  evaluation of mesoscale simulations of surface CO2 exchange and atmospheric CO2 mixing ratio against measurements made at a tall tower, over both eddy-resolving local and 1000x1000 km regional domains; and

6)  investigation of the sensitivity of regional coupled simulations of land- atmosphere carbon exchange to the resolution of satellite imagery used to derive spatial variations of ecophysiological parameters.

Full Proposal

Final Report

Publications

Students