

## Abstract

### Controls on Soil Surface CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> Fluxes, Ecosystem Respiration and Global Warming Potentials in Great Plains Agricultural Ecosystems

Timothy J. Arkebauer  
University of Nebraska – Lincoln

The overall goal of the project is to investigate interannual variability in relationships between ecosystem respiration, net ecosystem carbon exchange and global warming potential in important agroecosystems in the Great Plains region. We also intend to increase our understanding of the biophysical controls on ecosystem respiration and global warming potential and apply this knowledge towards development of crop management strategies to decrease adverse environmental impacts of agricultural systems.

The research activities will be carried out at the University of Nebraska – Lincoln and at the University of Nebraska's Agricultural Research and Development Center near Mead, Nebraska which are located within congressional district NE01.

The main hypothesis of the proposed research is that ecosystem respiration is a major determinant of annual net ecosystem carbon exchange and global warming potential, and their interannual variability, for maize and soybean agroecosystems in the Great Plains region.

The research will determine annual ecosystem respiration and global warming potential (and their associated interannual variability) for major agroecosystems in the Great Plains region through the acquisition of unique datasets on continuous, year round measurements of soil surface trace gas fluxes using a series of autochambers. We will couple the surface CO<sub>2</sub> fluxes with continuous estimates of aboveground plant respiration in order to provide annually integrated estimates of ecosystem respiration. We will also determine annual global warming potentials in the selected agroecosystems using the continuous measurements of surface N<sub>2</sub>O and CH<sub>4</sub> fluxes. In addition, we will obtain information on biophysical and physiological controlling factors governing spatial and temporal variability in surface gas fluxes, ecosystem respiration and global warming potentials in these systems.

The research will increase our understanding of the basic physical and biological processes controlling surface-atmosphere exchange of energy-related greenhouse gases in the context of major agricultural land management systems in the United States. The following information will be obtained for major agroecosystems in the Great Plains region: (1) annual ecosystem respiration and global warming potential and their associated interannual variability in these cropping systems at the field scale, (2) information on biophysical and physiological controlling factors which help explain the variability in ecosystem respiration and global warming potential, and (3) unique datasets on continuous, year round measurements of soil surface CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> fluxes, depth profiles of trace gas concentrations and relevant supporting variables in the selected agroecosystems.