NATIONAL INSTITUTE FOR
GLOBAL ENVIRONMENTAL CHANGE

University of California, Davis
1490 Drew Avenue, Suite 140

Davis, CA 95616-8756

Phone: (530) 757-3350

Fax: (530) 756-6499

e-mail: nigec@ucdavis.edu

<http://nigec.ucdavis.edu>

Final Technical Report

Federal Contract Agreement No. **DE-FC03-90ER61010**

UCD Project #901214

W. Lawrence Gates, Principal Investigator

Overview of NIGEC

The University of California operates NIGEC for the U.S. Department of Energy under a cooperative agreement through the University Office of the President. Since the Institute's inception in 1990, its mission has been to assist the nation in responding to environmental change by supporting university-based research on the interactions between climate and terrestrial ecosystems over a range of space and time scales. To this end, the Institute operates six Regional Centers at host universities located in characteristic ecosystems in different parts of the country; namely at the University of Nebraska in Lincoln, the University of Indiana in Bloomington, Harvard University in Cambridge, Tulane University in New Orleans, the University of Alabama in Tuscaloosa, and the University of California in Davis. Each regional center evaluates research proposals from investigators in their region, and recommends in coordination with the DOE those projects to be funded. The National Office is also located (off-campus) in Davis, California, and provides overall administrative coordination for the Institute, with the advice of the NIGEC Board of Trustees and a National Technical Advisory Committee.

Research Summary

With guidance provided by the Climate Change Research Program of the DOE Office of Biological and Environmental Research, NIGEC has supported university-based research under the subject award in four general areas as follows:

1. Carbon exchange and atmospheric CO₂ uptake by U.S. terrestrial ecosystems. In this area NIGEC has supported a wide range of research projects focussed on the structure and variation of the carbon balance over grasslands, forests and croplands, including studies of the roles of soil moisture, respiration and warming in the net surface CO₂ flux. Many of these studies have been carried out in conjunction with the AmeriFlux project. This research has revealed the complexity of the terrestrial carbon budget and the difficulty of obtaining representative measurements in the field.
2. Effects of environmental change on U.S. terrestrial ecosystems. In this area NIGEC has supported both laboratory and field studies of the response of important terrestrial ecosystems to changes in the atmospheric environment.

Primary attention has been given to the effects of increased atmospheric CO₂ on agricultural crops and on the biodiversity in regional vegetative ecosystems. The effects of environmental change on the behavior of selected plant pests, parasites and fungi and on the microbial activity in soil has also been studied. This research has demonstrated the importance of considering the joint effects of changes in temperature, soil hydrology and the concentration of greenhouse gases other than CO₂.

3. Development of ecosystem models needed for integrated assessment and for coupling with climate models. In this area NIGEC has supported the development and testing of models of selected forest, grassland and agricultural ecosystems, as well as models of the interacting surface and soil water budgets. Research has also examined the problems associated with upscaling local ecosystems into models representative of larger regions and the introduction of economic considerations for integrated assessment. This research has underscored the need to consider terrestrial ecosystems' interactions with the atmosphere, ocean and hydrology in models to be used for the simulation of future ecosystem behavior under climate change.
4. Research on the role of aerosols in the atmospheric radiation balance and their effects on processes involving terrestrial ecosystems. In this area NIGEC has supported both laboratory and field studies of the scattering, absorption and hygroscopic properties of carbon-containing aerosols and their effects on photosynthesis. The possible impact of sulfate-coated soot in the uptake of CO₂ by regional ecosystems has also been supported. This research has demonstrated the sensitivity of terrestrial ecosystems to local variations of the radiation budget, and has highlighted their possible role in regional climate change.

Publications and Reports

In addition to the preparation of progress reports for internal use, the community of NIGEC investigators has contributed over 2000 papers and technical reports to the scientific literature under the subject award. These include publications in the leading peer-reviewed journals in ecology, geophysics, biogeochemistry, meteorology and environmental change, and in books and conference proceedings. Collectively this output documents the high productivity of NIGEC researchers, and is testimony to the value of DOE's continued support of NIGEC.