

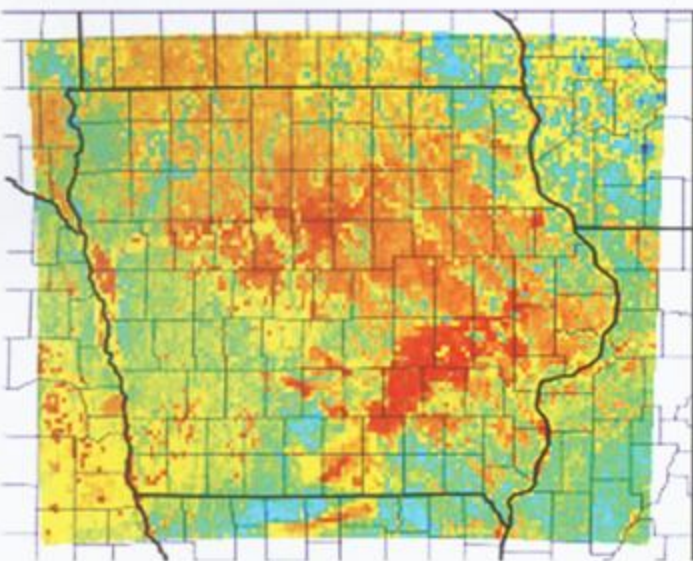
presented at the Great Midwestern Regional Space Grant Consortia meeting in Cleveland, Ohio, in Septemebr 2009. Journal articles are in progress on carbon-nanotube reinforced polymer composites and advanced visualization techniques.

University of Iowa

Increased demands on Iowa for biofuels production coupled with anticipated programs to reduce greenhouse gas emissions create a challenging set of questions and choices for stakeholders. Iowa Multiscale Carbon and Nitrogen Studies (IMCANS) is expected to lead to infrastructure, partnerships and collection of preliminary data necessary for large competitive proposals in this area.

During the past 12 months, multiple bottom-up (inventory-based) carbon flux estimates for Iowa were integrated and compared with top-down estimates. Small-scale results for erosional carbon fluxes measured by the Papanicolaou group were combined with larger scale fluxes, and considerable progress was made in developing an atmospheric simulation and data assimilation system for carbon dioxide in the upper Midwest. (**Thanos Papanicolaou**, U of I professor of civil and environmental engineering, and **Charles Stanier**, U of I assistant professor of chemical and biochemical engineering, are co-principal investigators of the project.)

The Papanicolaou group has established working collaborations with the NASA Ames group for getting satellite images and flux estimates that provide unique information about crop cover over the last 30 years. This includes NASA/USGS Landsat and MODIS imagery from the NASA Ecast group led by Rama Nemani at NASA Ames. Landsat imagery provides a tool for estimating historical land and crop cover. Also from the Ames Research Center, output



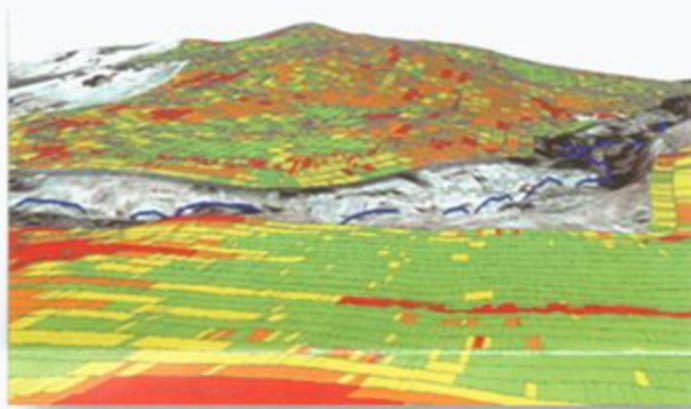
A snapshot of modeled carbon fluxes in Iowa on July 2, 2008. Red indicates transfer of carbon from the biosphere to the atmosphere; blue and green indicate transfer from the atmosphere to the biosphere.

from the CASA biosphere model is an excellent comparison to our inhouse implementation of biosphere flux models.

Students gave presentations at the annual meeting of the American Institute of Chemical Engineers in Nashville in November 2009, a seminar at the UNI Department of Earth Science in December 2009, the Iowa Renewable Energy Association Expo in September 2009 and a webinar sponsored by Vaisala, a manufacturer of electronic measurement systems and equipment for meteorological and environmental sciences, in April 2009, and the University of Iowa Research Open House in April 2010.

University of Northern Iowa

UNI's base program, Enhancing Remote Sensing Education in Iowa, has successfully recruited students to provide education and research opportunities in geospatial technology and other



Yield analysis using LIDAR and remote sensing imagery

areas. For example, undergraduate **Andrew Wille**, in a study exploring the various physical and environmental factors that affect crop yield, is focusing on precision farming using remote sensing data. The figure above demonstrates the use of aerial remote sensing and LIDAR data to analyze crop yield.

Another example is the Arctic Fires Exploratory Study (AFES), which aims to conduct an exploratory spatiotemporal analysis to reveal spatial patterns and temporal fluctuations of wildfire events in different parts of the Arctic using MODIS-derived products. AFES has been collaborating with the Fore Information for Resource Management System, NASA Goddard Center's affiliate at the University of Maryland, on the project. One of the two undergraduate students working on the project, **Jonathon Launspach**, presented preliminary findings at the State of the Arctic conference in Miami, Fla., earlier in the spring.

An introductory two-day GIS/GPS workshop, sponsored in part by the UNI base program, was presented to students of the Nebraska Indian Community College (NICC) in South Sioux City in March 2010 as part of an ongoing series of training workshops for NICC students.

Research Infrastructure

First Iowa NASA EPSCoR project under way

Michael Kessler, assistant professor of materials science and engineering at Iowa State University, was awarded the first Iowa NASA EPSCoR (Experimental Program to Stimulate Competitive Research) grant in the fall of 2009. NASA EPSCoR aims to strengthen research and education in science and engineering.

With a three-year grant of more than \$700,000, Kessler and his team are designing and evaluating a new class of polymer matrix composites that would carry load as well as store energy. "We are developing composite materials that can achieve significant weight savings by performing multiple functions at once," Kessler said.

Composites are frequently used in aerospace materials—hence the importance of decreasing their weight—and for other purposes as well. One way that the researchers will achieve their goal is through nanotechnology, the study of the control of matter on a molecular scale.

ISU's Polymer Composites Research Group, led by Kessler, is looking at the following means of processing polymer matrix composites: thermal analysis and cure kinetic modeling, monomer development for ring-opening metathesis polymerization (ROMP), ROMP-based polymers reinforced with functionalized carbon nanotubes, cyanate ester composites and nanocomposites with low temperature processability, tailoring coefficients of thermal expansion using nanoparticles, and resin transfer molding.

Other researchers on the team are Nicola Bowler, associate professor, Zhiqun Lin, assistant professor, and Xiaoli Tan,



Professor Michael Kessler characterizing the properties of a polymer composite sample in his lab at Iowa State

associate professor, all in ISU's department of materials science and engineering, and Olesya Zhupanska, assistant professor of mechanical engineering at the University of Iowa. The project, which began September 1, 2009, also includes graduate students and undergraduate research assistants.

The Iowa NASA EPSCoR funding process begins with a call for proposals described in concept papers in the fall of the year, followed by proposal outlines and then full proposals as the pool of applicants is reduced. All researchers in Iowa, either academic or industrial, are eligible to participate. For more detailed information on applying for EPSCoR funds, visit www.ia.spacegrant.org.

EPSCoR finalists announced

After a rigorous selection process beginning with concept papers and culminating in fully developed proposals, the two entries for Iowa's NASA EPSCoR (Experimental Program to Stimulate Competitive Research) grants have been submitted to NASA. The research period would begin in the fall of 2010 and continue through at least fall of 2013, with a maximum funding of \$750,000 for the three-year period. All researchers in Iowa, either academic or industrial, are eligible to participate.

The finalists and the titles of their proposals are listed below. Grants will be awarded in July or August.

"Agricultural Soil Erosion and Carbon Cycle Observations in Iowa: Gaps Threaten Climate Mitigating Policies"

University of Iowa

Thanos Papanicolaou, IIHR and professor of civil and environmental engineering

Charles Stanier, IIHR and assistant professor of chemical and biochemical engineering

Gregory Carmichael, CGRER and professor of chemical and biochemical engineering

Iowa State University

Lee Burras, professor of agronomy

Jeri Neal, Leopold Center for Sustainable Agriculture

USDA

Jerry Hatfield and **Cindy**

Cambardella, National Laboratory for Agriculture and Environment

NASA Collaborators

G. James Collatz, Hydrospheric and Biospheric Sciences Lab, Goddard

Ali Tokay, Mesoscale Atmospheric Processes Branch, Goddard

Ramakrishna Nemani, Biospheric Sciences Branch, Ames

"AMES: Advanced Materials for Energy Storage—New Safe, High Rate, High Capacity Materials for Next Generation Lithium Batteries for Space Exploration"

Iowa State University

Steve W. Martin, distinguished professor of materials science and engineering

Scott Beckman, assistant professor of materials science and engineering

NASA Collaborators

Michelle Manzo, GRC-RPCO, Glenn

William C. West, Jet Propulsion Laboratory