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Geospatial Sciences Center of Excellence (GSCE)

2009

# Triennial Report: 2006-2008

Geographical Information Science Center of Excellence

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# Triennial Report 2006 - 2008



# Geographic Information Science Center of Excellence

# South Dakota State University







# **Triennial Report Purpose**

Welcome to the Geographic Information Science Center of Excellence Triennial Report. This report introduces the Center and summarizes the last 3 years (2006-2008) of activity. The intent of this report is to advertize our achievements to the wider academic community, attract new students and post-doctoral researchers, and to provide a baseline to measure our future progress.

South Dakota is named after the Lakota and Dakota Sioux American Indian tribes. The state was admitted to the Union in 1889, and today has a population of about 800,000. South Dakota is a beautiful rural state with a continental climate and four distinct seasons, ranging from very cold winters to hot summers. In 2007 it was ranked the 9th most livable state by the CQ Press Annual Ranking based on 44 factors, including median household income, crime rates, employment, health, environment and education.

A number of people helped me to put this report together but special thanks go to Henok Alemu and Marcia Prouty. The front and back cover images are based on photographs taken by Sanath Kumar and Erik Lindquist. The satellite images were taken from publicly available NASA resources. The report was generated with Microsoft Publisher using Berlin Sans, Arial and Times New Roman fonts.

David P. Roy Triennial Report Editor Professor, SDSU



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# The Geographic Information Science Center of Excellence

The Geographic Information Science Center of Excellence (GIScCE) was inaugurated as a formal collaboration between South Dakota State University and the United States Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS) just three years ago. The GIScCE mission is to apply geographic information science capabilities, especially remote sensing, to advance the scientific understanding of the Earth System and, in particular, the characteristics and consequences of a changing global landscape.

Through the GIScCE, the interdisciplinary SDSU-EROS research team applies remote sensing, geographic information systems, geostatistics, digital mapping, and modeling to document and understand the changing earth. From the perspective of the USGS EROS, the GIScCE provides a unique and powerful opportunity to advance USGS

EROS efforts to provide operational observation and monitoring that supports USGS science goals related to climate change, ecosystem dynamics, human health and the environment, natural hazards, and water needs.

The idea and vision for the GIScCE was formed and implemented by scientific and administrative leaders at SDSU, EROS, and the South Dakota State Board of Regents. As this report shows, we have made significant progress in achieving our founders' original vision.



#### The GIScCE truly represents a unique

partnership that strengthens both SDSU and EROS. Since inception in September 2005, the senior scientists from SDSU and EROS have worked together to make the GIScCE a recognized global center for geographic information science studies.

Tom Loveland Research Physical Scientist, USGS EROS Center Adjunct Professor, SDSU Co-Director, GIScCE

## **Three Years in Review**

During its brief history, the Geographic Information Science Center of Excellence has made its mark in the field of terrestrial monitoring using remotely sensed data. Our primary focus is research. Our faculty, post doctoral researchers, students and support staff have generated exciting results that have begun to garner national and international attention. As you will see in this report, almost all of our work is focused on large area analyses that attempt to bring greater clarity to the rates and causes of environmental change. This is funded by competitively awarded grants. The GIScCE currently has over \$12,000,000 of external funding with primary sources from NASA, NIH, USDA, and USAID. Many of these awards are collaborations with other international, national and state research institutions. Key to our success is the collaborative efforts of the GIScCE partner organizations – SDSU and EROS. Our team of scientists works together in advancing the goals of EROS by performing pathfinding earth observation science. We are also part of a competitive global community of researchers who continually seek to exploit new information sources, methods, and environmental variables to improve our understanding of the global environment.

The GIScCE administers the Geospatial Science and Engineering (GSE) Ph.D. program. The program currently has more than 30 students enrolled; roughly half of these are full-time students supported directly by GIScCE research activities. Four Ph.D. students have won NASA Earth System Science (ESS) Fellowships. This highly competitive national program typically awards only 50 fellowships per year. The GSE program has been awarded almost 3% of the available ESS fellowships over the past three years and 12.5% within NASA's Land Cover Land Use Change program. Scholarly activity primarily takes the form of peer-reviewed journal publications. The GIScCE has over 75 such publications since 2006, including three in the *Proceedings of the National Academy of Sciences* and two in *Science*. GSE students have also begun to publish, with two student first-author peer-reviewed articles in 2008. We are regularly invited to attend international conferences focused on current issues related to the environment; and we perform service our discipline by participating in grant program review panels, international scientific organizations, and by editing and reviewing peer-reviewed journals and books.

Our success is a function of how relevant our ideas and results are to helping solve the challenges of a poorly understood, though intensively used, global environment. Our work can reduce these uncertainties and lead to a better managed and more sustainable global environment.

Matt Hansen Professor, SDSU Co-Director, GIScCE



Mark A. Cochrane Professor, SDSU

Ph.D. Ecology, Biology Department, The Pennsylvania State University, USA, 1998. S.B. Environmental Engineering Science, Massachusetts Institute of Technology, USA, 1993. Faculty SDSI

#### **Professional Positions**

Mark relocated to South Dakota State University in 2005 where he is currently a Senior Research Scientist and Professor in the Geographic Information Science Center of Excellence and both the Biology and Geography Departments. He has also been an associate researcher with the non-governmental organization (NGO) Instituto do Homem e Meio Ambiente na Amazônia (IMAZON) since 1995. Prior to working at SDSU, he was a senior research scientist with the Center for Global Change and Earth Observations (CGCEO) and an adjunct professor with the Geography Department at Michigan State University. From 1998-1999, he lived in Brazil and was a postdoctoral scientist with the Woods Hole Research Center and an associate researcher with the NGO Instituto de Pesquisa Ambiental da Amazônia (IPAM).

#### **Research Interests**

Dr. Cochrane's research focuses on understanding spatial patterns, interactions and synergisms between multiple physical and biological factors that affect ecosystems. Recent work has emphasized human dimensions of land-cover change and the potential for sustainable development. Ongoing research projects, funded by NASA and the Joint Fire Science Program, aim to understand disturbance regime changes and biodiversity impacts resulting from various forms of forest management and degradation, including fire, fuels treatments, fragmentation and logging. Dr. Cochrane's interdisciplinary work combines ecology, remote sensing and other fields of study to provide a landscape perspective of dynamic processes involved in land-cover change. He has published more than 30 peer reviewed scientific journal papers, 13 book chapters, and edited or authored 3 books. His most recent book, *Tropical Fire Ecology: Climate Change, Land Use and Ecosystem Dynamics* (Springer-Praxis) provides detailed information on the fire situation for roughly half of the planet's fire-affected surface (available, January 2009).

#### Teaching

*Fire and Ecosystems* (GSE/GEOG/WL/BIOL-767), Mark Cochrane, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Spring 2006, Spring 2007, Spring 2009.

Advanced Remote Sensing Applications: Fire and other disturbances (GSE/GEOG-766), Mark Cochrane and David Roy, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Spring 2008.



#### Matthew C. Hansen Professor, SDSU

Ph.D., Department of Geography, University of Maryland at College Park, USA, 2002. M.S.E, Department of Civil Engineering, University of North Carolina at Charlotte, USA, 1995. M.A., Department of Geography, University of North Carolina at Charlotte, USA, 1993. B.E.E., Electrical Engineering, Auburn University, Auburn, USA, 1988.

#### **Professional Positions**

Upon graduation from Auburn University, Matt entered the Peace Corps and worked for two years as an aquaculture extension agent in Zaire from 1988 to 1991. After his graduate study at UNC-Charlotte, he worked at the University of Maryland for ten years, first as a Faculty Research Assistant and then as an Assistant Research Scientist upon completion of his Ph.D. Matt began his work at the GIScCE in 2004 as a Professor of Geography and Center Co-Director with Tom Loveland.

#### **Research Interests**

Dr. Hansen specializes in characterizing large area (regional to global scale) land cover dynamics using remotely sensed data sets. An overarching objective is to distill the input data, algorithms, and thematic outputs down to a level at which they can be operationally implemented for monitoring the changing earth surface. Current investigations led by Dr. Hansen include an assessment of global forest cover change, operational mapping of the principal U.S. corn and soybean production area, and improving forest cover characterizations of the Congo Basin in Central Africa. Outputs from these studies feed other science investigations including carbon, climate, hydrological and biodiversity conservation modeling efforts.

Matt is a member of the NASA MODIS Land Science Team, and is responsible for the MODIS vegetation continuous field products. Matt is also a member of the Global Observations of Forest Cover - Global Observations of Land Dynamics Forest Implementation Team, an international panel whose focus is improving the use of satellite data sets in advancing terrestrial monitoring. Matt has published over 30 scientific peer reviewed journal articles and 4 book chapters on land cover monitoring. His land cover maps have been featured in National Geographic atlases and monthly issues of the National Geographic Society magazine.

#### Teaching

*Quantitative Remote Sensing* (GEOG-485), Undergraduate level course offered in sequence with *Remote Sensing* (Geog-484), Spring 2008.

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*Land Cover Mapping* (GSE/GEOG-760), Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Spring 2007.



### Geoffrey M. Henebry Professor, SDSU

Ph.D. in Environmental Sciences, The University of Texas at Dallas, USA, 1989. M.S. in Environmental Sciences, The University of Texas at Dallas, USA, 1986. B.A. in Liberal Arts, St. John's College, Santa Fe, USA, 1982.

#### **Professional Positions**

Geoff was a Post-Doctoral Fellow and then Research Assistant Professor with the Konza Prairie Long Term Ecological Research (LTER) Project at Kansas State University, 1989-1996. During a Fulbright Senior Research Fellowship from 9/1993 to 3/1994, he worked at INPE (the Brazilian National Institute for Space Research) on characterizing flooding dynamics in the Pantanal Matogrossense using Synthetic Aperture Radar. Geoff joined the Department of Biological Sciences at Rutgers-Newark in 1996 as an Assistant Professor. However, the Great Plains beckoned and Geoff and his family moved to the University of Nebraska-Lincoln in 1999. He worked in the Center of Advanced Land Management Information Technologies as an Associate Geoscientist in the Conservation and Survey Division and then as a Research Associate Professor in the School of Natural Resource Sciences until moving north to South Dakota State University in 2005. Geoff is a Professor of Biology and Geography and a Senior Research Scientist in the Geographic Information Science Center of Excellence. He currently serves as the Coordinator of the Ph.D. program in Geospatial Science and Engineering.

#### **Research Interests**

The spatio-temporal dynamics of the vegetated land surface as observed by remote sensors, or *land surface phenology*, for short. The biogeophysical consequences of land use land cover change (LCLUC), particularly land-atmosphere interactions. Effects of climatic variability and change on land surface dynamics. Landscape ecology of grasslands, croplands, and disturbance.

Geoff serves on Board of Directors of the USA National Phenology Network (http://usanpn.org) and is the current chair of its Remote Sensing Working Group. Geoff has been a member of the NASA LCLUC Science Team since 2001. He currently serves on the editorial boards of *BioScience, Landscape Ecology*, and *Applied Vegetation Science*, and previously for *Ecology/Ecological Monographs* and *Conservation Ecology*. He has contributed to more than 50 scientific papers and reports and five book chapters. Geoff's research is currently funded by NASA and NIH and has been supported in the past by NSF, USGS, USDA, DOE, EPA, and NATO. He is active in the American Geophysical Union (AGU) and the US Chapter of the International Association for Landscape Ecology (US-IALE). Geoff is a Certified Senior Ecologist by the Ecological Society of America.

#### Teaching

Introduction to Geospatial Science and Engineering (GSE 740), Graduate level course required as part of the Geospatial Science and Engineering Ph.D. program, Fall 2006, Fall 2008.

Advanced Methods in Geospatial Modeling: Change Analysis (GSE/GEOG 760), Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Fall 2007.



#### David Roy Professor, SDSU

Ph.D. Remote Sensing, Geography Department, University of Cambridge, U.K., 1994.
M.Sc. Remote Sensing and Image Processing Technology, Meteorology Department, University of Edinburgh, U.K., 1988.
B.Sc. Geophysics, Environmental Sciences Department, University of Lancaster, U.K., 1987.

#### **Professional Positions**

David was a postdoctoral research fellow with the National Environment Research Council for Thematic Information Systems, University of Reading, U.K., 1993 to 1994 and with the Space Applications Institute of the Joint Research Center of the European Commission, Ispra, Italy, 1994 to 1996. In 1996 he moved to the United States to take a position as an assistant and then as an associate research scientist in the Department of Geography, University of Maryland, and to lead the Moderate Resolution Imaging Spectroradiometer (MODIS) Land Data Operational Product Evaluation group at NASA's Goddard Space Flight Center. David relocated to South Dakota State University in 2005 where he is currently a Senior Research Scientist and Professor in the Geographic Information Science Center of Excellence and the Geography Department.

#### **Research Interests**

The development of remote sensing and advanced computing methods to integrate/fuse satellite sensor data and to map and characterize terrestrial change, particularly the occurrence and characteristics of vegetation fires; the causes and consequences of land cover and land use change; and fire-climate-vegetation interactions. He is also interested in development of methodologies to facilitate the transfer of remote sensing products into the user domain, particularly in developing countries.

David is a member of the NASA MODIS Land Science Team, and is responsible for the MODIS global burned area product. He is a recipient of three NASA group achievement awards recognizing his contributions to the NASA MODIS Terra and Aqua missions. David has published more than 45 peer reviewed scientific journal papers and 4 book chapters. His most recent NASA grant, "*Web-enabled Landsat data (WELD) - a consistent seamless near real time MODIS-Landsat data fusion for the terrestrial user community*" is for more than three million dollars.

#### Teaching

*Quantitative Remote Sensing for Terrestrial Monitoring* (GSE/GEOG-741-S01), David Roy, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Fall 2006, Fall 2007, Spring 2009.

Advanced Remote Sensing Applications: Fire and other disturbances (GSE/GEOG-766-S01), Mark Cochrane and David Roy, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Spring 2008.



### Michael Wimberly Associate Professor, SDSU

Ph.D. Ecology, College of Forestry, Oregon State University, 1999.
M.Sc. Quantitative Resource Management, College of Forest Resources, University of Washington, USA, 1995.
B.Sc. Environmental Science, Department of Environmental Sciences, University of Virginia, USA, 1990

#### **Professional Positions**

Mike was a postdoctoral research scientist with USDA Forest Service Pacific Northwest Research Station from 1999 through 2001. He was an Assistant Professor of Forest Landscape Ecology in the Warnell School of Forest Resources at the University of Georgia from 2001 through 2005. In 2005, he joined the newly-created Geographic Information Science Center of Excellence at South Dakota State University. He currently holds the position of Senior Research Scientist and Associate Professor in the Geographic Information Science Center of Excellence and the Geography and Wildlife and Fisheries Sciences departments.

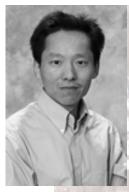
#### **Research Interests**

Mike conducts research in the areas of landscape ecology and spatial epidemiology. His current work focuses on integrating ecological concepts with the application of satellite imagery, GIS datasets, and spatial statistics to assess environmental and health hazards at broad spatial scales. Specific projects include: studying how landscape patterns of fuels, vegetation, and physiography affect the risk of high-severity wildfire in the western United States; examining the influences of physical and social environments on geographic patterns of obesity across the United States; using satellite remote sensing to develop early warning systems to predict outbreaks of West Nile virus and malaria; and exploring the environmental implications of expanded biofuels feedstock cultivation in the United States.

Mike's research is supported by grants from a variety of external funding sources, including the National Institutes of Health (*An Integrated System for the Epidemiological Application of Earth Observation Technologies*, 1R01Al079411-01) and the USDA National Research Initiative (*Influences of Physical and Social Landscapes on the Health of Rural Communities*, SDR-2007-04544).

#### Teaching

*Geospatial Analysis* (GSE/GEOG-743-S01), Michael Wimberly, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program: Spring 2006, Spring 2007, Spring 2008.



Chunsun Zhang Associate Professor, SDSU

Ph.D. Photogrammetry and Remote Sensing, Swiss Federal Institute of Technology Zurich, Switzerland, 2002.
M.Sc. Geomatics, Liaoning Technical University, China, 1991.
B.Sc. Survey Engineering, Liaoning Technical University, China, 1988

#### **Professional Positions**

Chunsun relocated to South Dakota State University in 2005 where he is currently a Senior Research Scientist and Associate Professor in the Geographic Information Science Center of Excellence and Geography Departments. Prior to working at SDSU, he was a senior research scientist with the Department of Geomatics, The University of Melbourne, Australia, and project leader at the Cooperative Research Center for Spatial Information, Australia. From 2002-2004, he was a postdoctoral scientist with the Institute of Geodesy and Photogrammetry, Swiss Federal Institute of Technology, Zurich.

#### **Research Interests**

The development of improved models, algorithms and computational systems for automated feature extraction, mapping, change detection and geodatabase updating from airborne, spaceborne and terrestrial sensor data. His research also involves sensor calibration, sensor orientation modeling, 3D surface analysis and interpretation, and multi-source data fusion, which are necessary to support metric feature extraction, 3D reconstruction and visualization.

Recent work emphasized geometric processing of ever-emerging high-resolution commercial satellite imagery, and its application in 3D mapping, tectonic deformation modeling supported by USGS. He also researches a systemic radiometric calibration approach for LDCM and the Landsat archive in a NASA/USGS funded project. His most recent project supported by the US Department of Transportation, aims to develop a remote sensing system for efficiently monitoring the condition of transportation infrastructure such as roads based on Unmanned Aerial Vehicle (UAV) platform.

#### Teaching

*Image Geometry and Photogrammetry* (GSE/GEOG-760-S01), Chunsun Zhang, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Fall 2006, Spring 2008.



# Kevin Gallo



*Physical Scientist*, NOAA, USGS EROS Center *Adjunct Professor*, SDSU

Ph.D., Agricultural Meteorology/Remote Sensing, College of Agriculture, Purdue University, 1984. M.S. Agricultural Climatology, College of Agriculture, Purdue University, 1981. B.S. Geography (Meteorology), Geography Department, Northern Illinois Univ. 1978. Faculty ERO

#### **Professional Positions**

Kevin is a Physical Scientist with the Center for Satellite Applications and Research within the National Oceanic and Atmospheric Administration (NOAA). He is physically located at the USGS Earth Resources Observation and Science (EROS) Center as a visiting scientist, where he is the lead investigator on several collaborative research efforts related to land-atmosphere interactions. Kevin has also been a visiting scientist at NOAA's National Climatic Data Center (1991-1998).

#### **Research Interests**

Kevin's current research activities are related to the use of remotely-sensed data to monitor and assess land-atmosphere interactions. These activities include assessment of data observed at climate stations for validation of satellite-derived products; satellite-based analysis and assessment of the urban heat island effect (warmer air temperatures associated with urban compared to rural environments) on trends in temperature observed at climate stations; and satellite-based estimates of the fractional green vegetation cover on the land surface, for use in the land surface component of numerical weather prediction models.

Kevin is a member of the Visible/Infrared Imager/Radiometer Suite (VIIRS) Operational Algorithm Team, the GOES-R Land Surface Algorithm Team, and the CEOS Land Surface Imaging Constellation Team. He serves as Chair of the NASA/USGS Land Processes Distributed Active Archive Center's User Working Group, is a former-member of the American Meteorological Society Board of the Urban Environment (1999-2003) and is currently a Board member of the International Association for Urban Climate (2006+). Kevin also serves on the Editorial Board for the journal *Geocarto International*.

#### Teaching

*Remote Sensing in Meteorology and Climatology* (GSE/GEOG-766-S01), Kevin Gallo, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Fall 2007.





#### Shuguang "Leo" Liu Research Ecologist, USGS EROS Center Adjunct Professor, SDSU

Ph.D. Forest Ecology and Hydrology, University of Florida, 1996 M.S. Forest Ecology, Beijing Forestry University, 1987 B.S., Forest Science, Central-South Forestry University, 1984

#### **Professional Positions**

Leo was a research scientist at the State Planning Commission, Beijing, China and the Chinese Academy of Sciences, Beijing, China prior to gaining his Ph.D. in 1996. He then moved to the USGS Earth Resources Observation and Science (EROS) Center as a government contractor. Since 2003 he has been an honorable Professor at the Chinese Academy of Sciences, China and an advisor to the US National Research Council. In 2008 he became a federal employee of the USGS Earth Resources Observation and Science (EROS) Center.

#### **Research Interests**

Leo is leading an interdisciplinary team to develop advanced data assimilation systems to improve the monitoring and forecast of land surfaces conditions including carbon sources and sinks, hydrological cycle, and ecosystem goods and services. He leads a USGS/NASA effort to develop innovative upscaling approaches to quantifying the spatial and temporal dynamic changes of contemporary carbon stocks and fluxes in the US, and quantify the economic and environmental consequences of biofuel production in the Northern Great Plains. He has played key roles in several interdisciplinary studies on estimation of carbon sequestration supply and prediction of ecological sustainability under various physical, socioeconomic, and environmental conditions at the regional scale in Central and North America, Asia, and Africa.

Leo's work has been funded by various agencies including NASA, NSF, DoD, USAID, USDA, and USGS. He has published more than 50 peer reviewed scientific journal papers. He currently serves on the editorial boards of *The Open Forest Science Journal* and *Tropical and Subtropical Botany*.

#### Teaching

*Principles of Land Surface Modeling* (GSE/GEOG-760-S02), Shuguang Liu, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Spring 2008.

#### Thomas R. Loveland Research Physical Scientist, USGS EROS Center Adjunct Professor, SDSU



Ph.D., Department of Geography, University of California, Santa Barbara, 1998 M.S. Department of Geography, South Dakota State University, 1976 B.S. Department of Geography, South Dakota State University, 1974

#### **Professional Positions**

Tom has held a number of geographic remote sensing positions dealing with land use and land cover issues. He started his career as a Land Use Analyst for the South Dakota State Planning Bureau in 1977. He also served as the Director of the Arizona State Land Department's Resource Analysis Division in Phoenix, AZ. Most of Tom's career has been spent at the USGS Earth Resources Observation and Science Center (EROS) where he has been engaged in many large area land cover characterization studies spanning local to global scales. Tom is currently leading Landsat science activities for the USGS and he provides science input to all USGS remote sensing activities. Tom has worked with Matt Hansen as co-director of the GISCCE since 2004.

#### **Research Interests**

Tom's interests revolve around understanding the geography of land change. Using remote sensing, he has investigated the characteristics of land use and land cover, the geographic variability in landscape dynamics, and the consequences of change on environmental systems. He has been involved in mapping land cover characteristics throughout the United States and globally. Tom was instrumental in reestablishing a national land cover mapping program in the USGS, and he was among the first to create continental and global-scale land cover data sets derived from remotely sensed imagery. His recent research has focused on documenting the rates, cause, and consequences of contemporary US land cover change. Tom chairs the USGS-NASA Landsat Science Team and was a member of the NASA National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project science team. He is a member of the editorial board for the Journal of Land Use Sciences and has served in leadership roles in a number of national and international science organizations including the American Society of Photogrammetry and Remote Sensing,

Climate Change Science Program, and the Global Observation of Forest Cover/Global Observation of Lands Dynamics. Tom has published over one hundred journal articles, book chapters, and other professional papers. He serves on numerous national and international science advisory panels dealing with remote sensing, and has received career achievement awards from the Department of the Interior, U.S. Geological Survey, American Society of Photogrammetry and Remote Sensing, and the Association of American Geographers.

#### Teaching

Introduction to Remote Sensing (GEOG-484), Fall 2007 2008.

Ecoregions Concepts and Applications (GEOG-490/590), Spring 2006.



Gabriel Senay Research Physical Scientist, USGS EROS Center Adjunct Professor, SDSU

Licensed Professional Engineer (P.E.) in Civil Engineering, Water Resources, 2002. Ph.D. Department of Agricultural Engineering, The Ohio State University, USA, 1996. M.Sc. Catchment Hydrology, Wageningen University, The Netherlands, 1991. B.Sc. Agricultural Engineering, Alemaya University, Ethiopia, 1986

#### **Professional Positions**

Gabriel joined the U.S. Geological Survey (USGS) Earth Resources Observation Science (EROS) Center as a Research Physical Scientist in 2008. Before that, he worked as a senior and principal scientist under different contractors (Raytheon, SAIC and ARTS) to USGS/EROS since 2000. Since 2005 his USGS/EROS appointment has been shared with the GIScCE at SDSU where he works as an adjunct professor in the Department of Agricultural and Biosystems Engineering and the Geographic Information Science Center of Excellence. He worked for 2 years (1998-2000) as a contactor to US Environmental Agency (EPA) in Cincinnati, Ohio. He moved to the United States in 1992 to pursue his Ph.D. work at the Ohio State University and undertook postdoctoral research at Oklahoma State University, Stillwater, Oklahoma (1996-1998).

#### **Research Interests**

Gabriel's research focus is on the integration of satellite-derived data with Agro-hydrologic modeling for water resources and agricultural production assessment and monitoring. His research focuses on developing simplified algorithms for operational early warning applications to monitor droughts and potential food security risks in the developing world. He seeks to maximize the societal benefit of earth observation systems though better resource assessment and planning that have been made possible due to improved access to remotely sensed data.

His research work is funded through grants obtained from various organizations such as NASA, USGS, USDA, NIH and NSF.

#### Teaching

*Remote sensing of water resources.* GSE/GEOG-766-SO2, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. program, Fall 2006, Fall 2007.



James E. Vogelmann Research Ecologist, USGS EROS Center Adjunct Professor, SDSU

Ph.D., Plant Biology, Indiana University, 1983 B.A., Botany, University of Vermont, 1978

#### **Professional Positions**

Jim started using satellite-based observations for ecological applications as a National Research Council postdoctoral researcher and staff member at the Jet Propulsion Laboratory, California from 1984-1987. He continued this line of investigation as a Research Assistant Professor at the Complex Systems Research Center, which is part of the Institute for the Study of Earth, Oceans and Space at the University of New Hampshire from 1987-1994. From 1994 to present, Jim has been at the USGS EROS Center. For most of this time, he has worked on various satellite-based land cover mapping and monitoring projects as a senior and principal scientist under various contracts. Recently, Jim joined the USGS EROS Center as a Research Ecologist. He has been affiliated with the Geographic Information Science Center of Excellence at South Dakota State University since 2005.

#### **Research Interests**

Jim's current research activities include characterizing the Earth's natural resources, conditions and changes, using remotely-sensed data. His current research efforts include conducting large area monitoring investigations, vegetation classification and land cover research, analysis of multi-temporal remotely-sensed data sets for characterizing multiple landscape properties and changes, vegetation characterization for fire hazard evaluation, and developing operational methodologies for employing remote sensing for assessment of gradual vegetation changes related to changing climate patterns and insect damage.

Major projects that he has worked on at USGS/EROS include LANDFIRE and the Multi-Resolution Land Characteristics (MRLC) 1990s National Land Cover Dataset. He is currently serving on the Landsat Science Team, and also served on the previous Landsat 7 Science Team.

#### Teaching

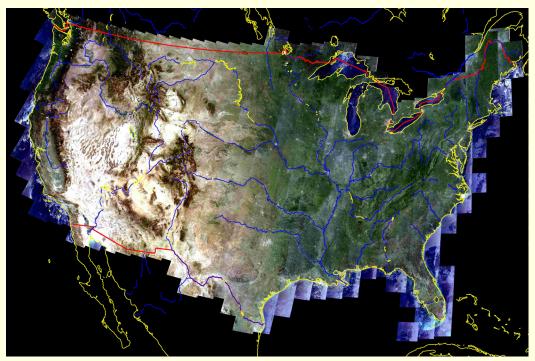
*Remote Sensing*, GEOG 484, (team-taught with Tom Loveland), Undergraduate level course offered in the Geography Department, Fall 2007

*Remote Sensing for Conservation Applications,* GSE/GEOG 766, Graduate level course offered as part of the Geospatial Science and Engineering Ph.D. Program, Spring 2007.

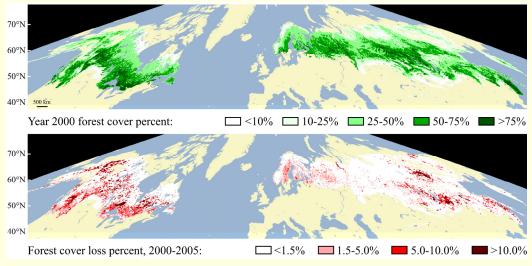


# **Post-Doctoral Researchers**

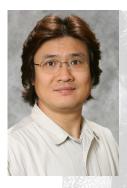
The GIScE is a "Research Center of Excellence" and post-doctoral researchers play a vital role in the research conducted at the center. Post-doctoral researchers work in collaboration with GIScCE faculty and are encouraged to seek their own research funding to grow the research portfolio of the Center and to develop their careers. Successful Ph.D. students are encouraged to take up post-doctoral positions at the GIScCE.



Landsat satellite 2008 image mosaic of the conterminious United States, more than 11 billion 30m pixels, illustrating the surface observed from space (J. Ju & D.P. Roy).



Year 2000 forest cover (top) and 2000-2005 forest cover loss (bottom) estimates for the boreal biome derived from MODIS satellite time-series data (*P. Potapov & M.C. Hansen*).



# Dr. Jiyul Chang

*GIScCE* Advisor Started Dr. Matthew Hansen Summer 2006

#### **Academic Qualifications**

Ph.D., Agronomy, South Dakota State University, USA, 2002 M.Sc., Agronomy, South Dakota State University, USA, 1997 B.Sc., Biology, Yon Sei University, South Korea, 1988

**Previous Post-Doctoral Position** 

South Dakota State University, Center for Biocomplexity Studies, USA, 2004–2006, Geospatial Data Analyst

South Dakota State University, Plant Science Department, USA, 2002–2004, Precision Agriculture Geospatial Data Analyst

**Current Research Interests** 

Identifying the spatial extent of croplands is an important step in predicting crop yields. Jiyul is working on mapping crops (corn, soybean, and wheat) using daily moderate spatial resolution MODIS and AWiFS satellite data time series, and using select high spatial resolution Landsat data at regional to continental scale across the United States.

**Representative Papers** 

Chang, J., Hansen, M., Pittman, K., Carroll, M., Dimiceli, C. (2007). Corn and soybean mapping in the United States using MODIS time-series data sets. *Agronomy Journal*. 99:1654-1664.

<u>Chang, J.,</u> S. A. Clay, D. E. Clay, D. Aaron, D. Helder, and K. Dalsted. (2005). Clouds influence precision and accuracy of ground-based spectroradiometers. *Communications in Soil Science and Plant Analysis.* 36:1799-1807.

Chang, J., D.E. Clay, K. Dalsted, S.A. Clay, and M. O'Neill. (2003). Corn (*Zea mays L.*) Yield prediction using multispectral and multidate reflectance. *Agronomy Journal*. 95:1447-1453.

# Dr. Ahmed Elaksher

GIScCE Advisor Dr. Chunsun Zhang Started Fall 2008

#### **Academic Qualifications**

Ph.D., Civil Engineering, Purdue University, USA, 2002 M.Sc., Civil Engineering, Purdue University, USA, 1999 M.Sc., Civil Engineering, Cairo University, Egypt, 1997 B.Sc., Civil Engineering, Cairo University, Egypt, 1995

**Previous Post-Doctoral Position** 

Ohio State University, Department of Civil & Environmental Engineering and Geodetic Science, Columbus, Ohio, USA, 2002-2003

**Current Research Interests** 

Automatic feature extraction is one of the most challenging problems in digital photogrammetry. High quality extracted objects are needed for a variety of applications such as cartography, GIS databases, and visual simulation. This requires both reliable feature extraction techniques and sensor models. Ahmed is interested in 3D object reconstruction algorithms from digital geospatial datasets including aerial and satellite images and laser scanner 3D datasets. In addition, he also works on sensor modeling and camera calibration.

**Representative Papers** 

<u>Elaksher, A.</u> and J. Bethel (2008). Automatic generation of high quality 3D urban buildings from aerial images. *Journal of Urban and Regional Information Systems Association,* 20(2): 5-14.

Elaksher, A. (2008). Fusion of hyperspectral images and LIDAR-based DEMs for coastal mapping. *Optics and Lasers in Engineering*, 46(7): 493-498.

Elaksher A., J. Bethel, and E. Mikhail (2003). Roof boundary extraction using multiple images. *The Photogrammetric Record,* 18(101): 27-40.



# Dr. Junchang Ju

GIScCE Advisor Dr. David Roy Started Fall 2006

Academic Qualifications

Ph.D., Geography, Boston University, USA, 2005 M.Sc., Geography, Beijing Normal University, China, 1996 B.Sc., Geography, Xibei University, China, 1993

**Previous Post-Doctoral Position** 

Boston University, Department of Geography, USA, 2005-2006, Postdoctoral research scientist working on the development of a statistical framework for multi-scale land cover classification.

**Current Research Interests** 

The MODIS and Landsat satellites are in the same polar orbit and, together, provide a balance between requirements for large area daily monitoring and localized high spatial resolution studies. Ju is working on physics based fusion of daily MODIS satellite data with 16-day Landsat data to provide a temporally complete 30m Landsat reflectance time series for the conterminous United States and Alaska. The resulting data is required for numerous terrestrial monitoring applications.

**Representative Papers** 

<u>Ju, J.</u> and Roy, D. P. (2008). The availability of cloud-free Landsat ETM+ data over the conterminous United States and globally. *Remote Sensing of Environment.* 112:1196-1211.

Roy, D.P., Ju, J., Lewis, P., Schaaf, C., Gao, F., Hansen, M., Lindquist, E. (2008). Multi-temporal MODIS-Landsat data fusion for relative radiometric normalization, gap filling, and prediction of Landsat data. *Remote Sensing of Environment.* 112:3112-3130.

Ju, J., Kolaczyk, E.D., and Gopal, S. (2003). Gaussian mixture discriminant analysis and sub-pixel land cover characterization in remote sensing. *Remote Sensing of Environment*, 84:550-560.

# Dr. Akihiko Michimi



GIScCE Advisor Dr. Michael Wimberly Started Fall 2008

**Academic Qualifications** 

Ph.D., Geography, University of Connecticut, USA, 2008 M.A., Geography, California State University, Los Angeles, USA, 2004 B.A., Geography, University of Oregon, USA, 1996

**Current Research Interests** 

Chronic "Western" diseases such as obesity are increasing in prevalence in the United States and around the world, but their environmental drivers are not well understood. Aki is a medical geographer whose interests include studying spatial patterns of health risk and chronic disease morbidity through the analysis of national health surveillance databases. He is currently working on a project that examines the influences of physical and social landscapes on the prevalence of obesity in rural America.

**Representative Paper** 

Michimi, A. and Berentsen, W.H. (2008). Small Business Establishment Profiles and Rapid Population Growth in Sunbelt Metropolitan Areas, 1995-2005. *Urban Geography*, 29(6): 526-555.





# Dr. Izaya Numata

GIScCE Advisor Dr. Mark Cochrane Started Summer 2007

**Academic Qualifications** 

Ph.D., Geography, University of California, Santa Barbara, USA, 2006 M.Sc., Remote Sensing, Instituto Nacional de Pesquisas Espaciais, Brazil, 1999 B.Sc., Agriculture Engineering, University of São Paulo, Brazil, 1996

**Previous Post-Doctoral Position** 

University of California, Santa Barbara, Department of Geography, USA, 2006-2007, Assistant Specialist in land cover change study of the Brazilian Amazon.

**Current Research Interests** 

Monitoring, characterizing and evaluating land-use and land-cover (LULC) dynamics and human-environmental interactions that cause LULC change are increasingly important. Izaya's research focus is on mapping forest fragmentation dynamics using remote sensing and the implications for forest degradation in the Amazon.

#### **Representative Papers**

<u>Numata, I.,</u> Roberts, D.A., Chadwick, O.A., Schimel, J.P., Galvão, L.S., Soares, J.V. (2008). "Evaluation of hyperspectral data for pasture characterization in the Brazilian Amazon using field and imaging spectrometers". *Remote Sensing of Environment*, 112:1569-1583.

<u>Numata, I.,</u> Roberts, D.A., Sawada, Y., Chadwick, O.A., Schimel, J.P., Soares, J.V. (2007). "Regional characterization of pasture changes through time and space in Rondônia using remote sensing." *Earth Interactions.* 11:1-25.

Numata, I., Chadwick, O.A., Roberts, D.A., Schimel, J.P., Sampaio, F.F., Leonidas., F.C., Soares., J.V. (2007). "Temporal and spatial nutrient variation in post-forest pastures, Rondônia, Brazil". *Agriculture, Ecosystems & Environment*. 118:159-172.



## Dr. Peter Potapov

GIScCE Advisor Dr. Matthew Hansen Started Spring 2006

**Academic Qualifications** 

Ph.D., Ecology and Natural Resources, Russian Academy of Science, Russia, 2005 B.Sc., Botany, Moscow State University, Russia, 2000

**Current Research Interests** 

Estimation of forest cover change is important for quantification of factors including forest conversion rates, biodiversity, global timber stocks, carbon emissions and sequestration. Peter's current research is to estimate global forest cover and gross forest cover loss from 2000 to 2005 using MODIS and Landsat data, to attribute the proportion of forest loss due to fire, to provide a spatially explicit depiction of these dynamics, and to analyze inter-annual variation of forest cover loss.

**Representative Papers** 

<u>Potapov P.,</u> Hansen M.C., Stehman S.V., Loveland T.R., Pittman K. (2008). Combining MODIS and Landsat imagery to estimate and map boreal forest cover loss. *Remote Sensing of Environment*, 112:3708-3719.

Hansen, M.C., Stehman, S.V., <u>Potapov, P.V.,</u> Loveland, T.R., Townshend, J.R.G., DeFries, R.S., Pittman, K.W., Stolle, F., Steininger, M.K., Carroll, M., Dimiceli, C. (2008). Humid tropical forest clearing from 2000 to 2005 quantified using multi-temporal and multi-resolution remotely sensed data. *Proceedings National Academy of Sciences*, 105:9439-9444.

Hansen, M.C., Shimabukuro, Y.E., <u>Potapov, P.V.,</u> Pittman, K.W. (2008). Comparing annual MODIS and PRODES forest cover change data for advancing monitoring of Brazilian forest cover. *Remote Sensing of Environment*, 112:3784-3793.



# Dr. Mirela Tulbure

GIScCE Advisor Dr. Michael Wimberly Started Fall 2008

#### **Academic Qualifications**

Ph.D., Biological Sciences, South Dakota State University, USA, 2008 M.Sc., Environmental Sciences and Policy, Central European University, Hungary, 2003 B.Sc., Ecology, University of Bucharest, Romania, 2002

#### **Current Research Interests**

The land cover of the Northern Great Plains (NGP) is likely to change given that the recent U.S. Renewable Fuel Standard calls for 36 billion gallons of ethanol production by 2022 with over half produced from plant biomass. Mirela is broadly interested in the ecological implications of biofuel production and currently is using satellite data to explore fire patterns in the NGP and understand how changes in regional land cover may affect the risk of wildfires to feedstock crops.

#### **Representative Papers**

Tulbure, M., C.A. Johnston, and D.L Auger. (2008). Rapid Invasion of a Great Lakes Coastal Wetland by non-native *Phragmites australis* and *Typha. Journal of Great Lakes Research.* 33: 269-279.

Johnston, C.A., Ghioca D., <u>M. Tulbure</u>, B. Bedford, M. Bourdaghs, C. B. Frieswyk, L. Vaccaro, and J. B. Zedler. (2008). Partitioning vegetation response to anthropogenic stress to develop multi-taxa indicators of wetland condition. *Ecological Applications*, 18: 983-1001.

Ghioca, D., C. A. Johnston, and <u>M. Tulbure.</u> *In press.* Assessing the Use of Multiseason QuickBird Imagery for Mapping a Lake Erie Coastal Marsh. *Wetlands*.

# Dr. Svetlana Turubanova



# GIScCE Advisor Started

Dr. Matthew Hansen Summer 2008

#### **Academic Qualifications**

Ph.D., Ecology, Pushchino State University, Moscow Oblast, Russia, 2002 M.Sc., Ecology, Pushchino State University, Moscow Oblast, Russia, 1998 B.Sc., Biology and Geography, Komi Pedagogical Institute, Syktyvkar, Russia, 1996

#### **Current Research Interests**

Quantifying rates of forest cover change is important for improved carbon accounting and climate change modeling, management of forestry and agricultural resources, and biodiversity monitoring. Svetlana's current research concentrates on the forest cover change analysis using Landsat data. These products are useful for validation and calibration of MODIS-derived global products.

#### **Representative Papers**

Potapov, P., A. Yaroshenko, <u>S. Turubanova,</u> M. Dubinin, L. Laestadius, C. Thies, D. Aksenov, A. Egorov, Y. Yesipova, I. Glushkov, M. Karpachevskiy, A. Kostikova, A. Manisha, E. Tsybikova, and I. Zhuravleva. 2008. Mapping the world's intact forest landscapes by remote sensing. *Ecology and Society* [online].

Zaugolnova L., Smirnova O., Potapov P., <u>Turubanova S.</u> Ecosystem diversity of forest cover based on ecological-and-floristic classification. Monitoring Russian forest biodiversity: methodology and methods (ed. A. Isaev); RAS Center for forest Ecology and Productivity. M, Nauka, 2008 pp. 112-130.

Yaroshenko A.Y., Potapov P.V., <u>Turubanova S.A.</u> The Last Intact Forest Landscapes of Northern European Russia. – Moscow: Greenpeace Russia and Global Forest Watch, 2001. – 75 pp (http://www.globalforestwatch.org/english/about/publications.htm).



# Dr. Chris Wright

GIScCE Advisor Dr. Geoffrey Henebry Started Spring 2008

**Academic Qualifications** 

Ph.D., Ecology, Montana State University, USA, 2004 M.Sc., Agronomy, Montana State University, USA, 1993 B.A., Biology, Williams College, USA, 1990

**Previous Post-Doctoral Position** 

U.S. Geological Survey Earth Resources Observation and Science Center, USA, 2004-2007, National Research Council Postdoctoral Associate working on ecological applications of wetland remote sensing.

**Current Research Interests** 

Recent NDVI trends in Central Asia and the Midwestern U.S. and climatic and land-use land-cover change drivers of those trends, application of network theory in landscape ecology, remote sensing applications in landscape hydrology, amphibian decline and climate change in Yellowstone National Park, ecological scaling, theoretical community ecology, complex systems.

#### **Representative Papers**

McMenamin, S.K., Hadly, E.A., <u>Wright, C.K. (2008)</u>. Climatic change and wetland dessication cause amphibian decline in Yellowstone National Park. *Proceedings of the National Academy of Sciences USA*, 105: 16988–16993.

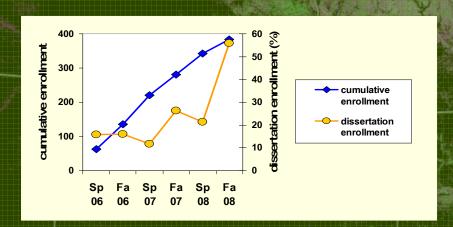
<u>Wright, C.K. (2008)</u>. Ecological community integration increases with added trophic complexity. *Ecological Complexity*, 5:140-145.

<u>Wright, C.K.,</u> Gallant, A.L. (2007). Improved wetland remote sensing in Yellowstone National Park using classification trees to combine TM imagery and ancillary environmental data. *Remote Sensing of Environment*, 107:582-605.

# Geospatial Science and Engineering (GSE) Ph.D. Program

The Geospatial Science and Engineering Ph.D. is a novel interdisciplinary program that integrates advanced coursework in the sciences and engineering with cuttingedge research to advance the emerging field of Geographic Information Science. This field seeks to understand geospatial data and transform it into relevant information through acquisition, processing, characterization, analysis, and modeling.

Core faculty of the GSE doctoral program are the senior scientists at the Geographic Information Science Center of Excellence and members of the departments of Electrical Engineering, Geography, Civil and Environmental Engineering, Biology & Microbiology, Wildlife & Fisheries Sciences, and Physics. The degree is available with two declared specializations - Remote Sensing Geography or Remote Sensing Engineering; however, declaration of a specialization is not required. Courses include: Introduction to GSE, GSE seminar, Quantitative Remote Sensing for Terrestrial Monitoring, Geospatial Analysis, Fire and Ecosystems, Remote Sensing Engineering, Image Geometry and Photogrammetry, and Active Sensor Systems. Two umbrella courses— Advanced Methods in Geospatial Modeling and Advanced Remote Sensing Applications—cover different topics in depth, including "Remote Sensing of Water Resources", "Remote Sensing of Fire and Other Disturbances", "Remote Sensing in Meteorology and Climatology", "Land Cover Mapping", "Change Analysis", "Conservation Applications", and "Biogeochemical Modeling".



The Geospatial Science and Engineering (GSE) Ph.D. program is administered through the GIScCE and is coordinated by Dr. Geoffrey Henebry. The first GSE Ph.D. degree was awarded in December 2006 to Dean Gesch, a scientist at USGS EROS who had substantially completed his doctoral studies under a previous SDSU program.

The GSE program currently has more than 30 students enrolled; roughly half of these are full-time students supported directly by the GIScCE research activities or NASA fellowships. The majority of part-time GSE students are USGS EROS scientists seeking professional development through the acquisition of a Ph.D. degree. Since 2006, the GSE courses have enrolled 384 students. A large number of these students have completed coursework and are now pursing dissertation research.



# Henok Alemu

GIScCE Advisor Dr. Gabriel Senay Started Spring 2007

Academic Qualifications M.Sc., Photogrammetry & Geoinformatics, Stuttgart University of Applied Sciences, Germany, 2006 Professional Masters, GIS, ITC, Netherlands, 2004 B.Sc., Applied Geology, Mekelle University, Ethiopia, 2001

#### **Current Research Interests**

Remote sensing applications for water resource and drought monitoring, with an emphasis on the analysis of regional precipitation, evapotranspiration patterns and trends in East Africa.

#### **Representative Paper**

<u>Alemu, H.</u>, G.B. Senay, N.M. Velpuri and K.O. Asante (2008), Monitoring water resources in pastoral areas of east Africa using satellite data and hydrologic modeling, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract H43G-1144



### **Rafael Barreto de Andrade**

GIScCE Advisor Dr. Mark Cochrane Started Spring 2008

Academic Qualifications M.Sc., Ecology, Universidade Estadual de Campinas, Brazil, 2007 B.Sc., Biological Sciences, Universidade Estadual de Campinas, Brazil, 2003

**Current Research Interests** 

Biodiversity and conservation in tropical forests, with an emphasis on community and population ecology of insects and the effects of forest fires on dung beetle (*Scarabeinae*) communities in the Brazilian Amazon.

**Representative Paper** 

<u>De-Andrade, R. B.</u> & A. V. L. Freitas. 2005. Population biology of two species of *Heliconius* (Nymphalidae: Heliconiinae) in a semi-deciduous forest in Southeastern Brazil. *Journal of the Lepidopterists' Society of London*, 59:223-227.



# **Christopher Barnes**

GIScCE Advisor Dr. David Roy Started Fall 2005

Academic Qualifications M.Sc., Geography, South Dakota State University, USA, 2004 B.Sc., Geographic Information Science, Manchester Metropolitan University, U.K., 2002

Ph.D. Thesis Title

United States Land Cover Land Use Change, Albedo and Radiative Forcing: Past and Potential Climate Implications

**Current Research Interests** 

The use of remote sensing and advanced computing methods to study the impact of land cover and land use change on the earth's radiative energy balance and the continental scale climate implications.

#### **Representative Paper**

Barnes, C.A. and Roy, D.P. 2008. Radiative forcing over the conterminous United States due to contemporary land cover land use albedo change, *Geophysical Research Letters*, 35, L09706, doi:10.1029/2008GL033567. AGU Journal Highlight, *EOS*, 89, 24, 10<sup>th</sup> June 2008, p 221.



# **Mark Broich**

GIScCE Advisor Dr. Matthew Hansen Started Fall 2006

Academic Qualifications M.A., Geography, Technical University Aachen, Germany, 2005

Ph.D. Thesis Title

Improved Deforestation Estimates for the Humid Tropics: Regional Prototyping for the Brazilian Amazon

**Current Research Interests** 

Application of multi-resolution optical remote sensing data in combination with "smart sampling" approaches to estimate amounts and rates of humid tropical forest clearing.

#### **Representative Paper**

Broich, M. and Hansen, M.C. (2007), A Megamodel-Classifier in Support of a Sampling Strategy Using Landsat Data to Estimate Deforestation in the Brazilian Amazon, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract GC13A-0944

# Jean-Robert B. Bwangoy-Bankanza **GIScCE** Advisor Started

Dr. Matthew Hansen Fall 2005

#### **Academic Qualifications**

M.Sc., Geographic Information Science, University of Redlands, USA, 2003 B.Sc., Forest Engineering, University Laval, Canada, 1989

# Ph.D. Thesis Title

Wetlands Characterization in the Congo River Basin using Multi-source Remote Sensing Data

#### **Current Research Interests**

Modeling the extent and distribution of wetlands in the tropics using optical and radar data; analysis of phenological variations across latitudes and between wetlands and non-wetlands in the Congo River Basin.



# **Christopher P. Barber**

GIScCE Advisor Dr. Mark Cochrane Started Spring 2006

Academic Qualifications B.Sc., Environmental Studies, Richard Stockton College of New Jersey, USA, 1997

**Ph.D.** Thesis Title Measuring and monitoring the efficacy of Brazil's protected area network in the Amazon

#### **Current Research Interests**

Conservation, fire and disturbance in tropical forests, anthropogenic process and pattern in tropical landscapes.

**Representative Paper** Cochrane M.A. and Barber C.P., In Press. Future Fire Regimes of the Amazon: Climate Change and Human Land Use. Global Change Biology.



# Jeffrey J. Danielson

GIScCE Advisor Dr. Thomas Loveland Started Fall 2005

Academic Qualifications M.Sc., Geography, South Dakota State University, USA, 2000 B.Sc., Geography, South Dakota State University, USA, 1994

Ph.D. Thesis Title Continental geospatial applications using the ICESat II laser altimeter data

#### **Current Research Interests**

Exploitation of passive and active remote sensing data for change detection research, terrain analysis, bare-earth digital elevation model (DEM) processing and hydrological derivative applications.

#### **Representative Paper**

Danielson, J.J. and Gesch, D.B. 2008. An enhanced global elevation model generalized from multiple higher resolution source datasets, *Proceedings of The International Archives of the Photogrammetry, Remote Sensing, and Spatial Information Sciences*, Beijing, China, July 3-11, 2008, p. 1857-1863.



### **Amadou Moctar Dieye**

GIScCE AdvisorDr. David RoyStartedFall 2005

#### Academic Qualifications

M.A., Geographic Information Systems & International Development, Clark University, USA, 1998 B.Sc., Survey and Engineering, Ecole Nationale Superieure de Geologie, France, 1988

Ph.D. Thesis Title

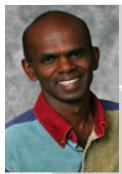
Land Cover Land Use Change and Soil Organic Carbon under Climate Variability in Sahelian West Africa (1975-2055)

#### **Current Research Interests**

The use of remote sensing and Geographic Information Systems techniques for natural resources monitoring, mapping land use and land cover change, and the relationship between climate change and land cover land use in semi-arid to sub-humid West Africa.

#### **Representative Paper**

Dieye, A. M. 2002. L'utilisation des Systèmes d'Information Géographique dans l'évaluation des impacts sur l'environnement. *African Journal of Environmental Assessment and Management*, 4: 28-38.



# Narayana Ganapathy

GIScCE AdvisorDr. Michael WimberlyStartedFall 2006

#### Academic Qualifications

M.GIS, Geographical Information Science, University of Minnesota, USA, 2006 B.Sc., Ecology and Natural History, University of Vermont, USA, 1995

#### Ph.D. Thesis Title

Interactions between forest road corridors and wildfire: Comparison between the Black hills of South Dakota and the Cascade mountains of Washington

#### **Current Research Interests**

Developing a predictive model to explain the drivers and variation in fire pattern across the landscape in order to inform and influence forest policy and management from biophysical and human perspectives.



# **Ronald "Ron" Hayes**

GIScCE Advisor Dr. Thomas Loveland Started Spring 2006

Academic Qualifications M.Sc., Geography, South Dakota State University, USA, 1992 B.A., Geography, South Dakota State University, USA, 1990

Ph.D. Thesis Title Comparative Analysis of Radiometric and Geometric Calibration on Remote Sensing Applications with Landsat Data.

#### **Current Research Interests**

Assessment of the radiometric and geometric accuracy of multispectral sensors, working as a Landsat calibration scientist for the US Geological Survey.



# Sheikh Md Nazmul Hossain

GIScCE Advisor Dr. Thomas Loveland Started Fall 2006

Academic Qualifications

M.Sc., Spatial Planning, Royal Institute of Technology, Stockholm, Sweden, 2001 B.Sc., Urban and Rural Planning, Khulna University, Bangladesh, 1998

Ph.D. Thesis Title Continental geospatial applications using the ICESat II laser altimeter data

#### **Current Research Interests**

The use of remote sensing to develop a Land Cover Land Use change monitoring system in North America.



# Collin G. Homer

GIScCE Advisor Dr. Thomas Loveland Started Fall 2001

Academic Qualifications M.Sc., Wildlife Management, Utah State University, USA, 1992 B.Sc., Geography, Weber State University, USA, 1986

Ph.D. Thesis Title

Developing a Remote Sensing Monitoring Framework for the Sagebrush Steppe Ecosystem in Wyoming

**Current Research Interests** 

Development of a large-area sagebrush steppe monitoring system using multiple scales of calibrated satellite imagery and ground measured plot data. The research will generate validated continuous estimates of percent bare ground, percent herbaceous, percent shrub, and percent litter cover.

#### **Representative Paper**

Homer, C.G., Aldridge, C., Meyer, D., Coan, M., and Z. Bowen. 2008. Multi-scale Sagebrush Rangeland Habitat Modeling in Southwest Wyoming, *USGS Open File 2008-1027*, 18pp.



# Valeriy Kovalskyy

GIScCE AdvisorDr. Geoffrey HenebryStartedFall 2006

#### **Academic Qualifications**

M.Sc., Environmental Sciences, Ohio University, USA, 2004 B.A., Geography, Lviv National University, Ukraine, 2001

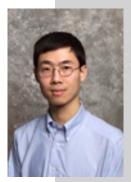
Ph.D. Thesis Title Event Driven Phenology Model

#### **Current Research Interests**

Empirical modeling of vegetation canopy responses to disturbances during different pheno-phases, including assimilation of *in situ* data and remote sensing observations to model vegetation daily dynamics.

#### **Representative Paper**

Kovalskyy, V., and G.M. Henebry. 2009. Recent trends in land surface phenologies within the Don and Dnieper River basins from the perspective of MODIS Collection 4 products. In: (P. Groisman, ed.) Regional Aspects of Climate-Terrestrial Hydrologic Interactions in Eastern Europe. *NATO Advanced Research Workshop Series*. In Press.



# Zhengpeng Li

GIScCE Advisor Dr. Shuguang (Leo) Liu Started Fall 2006

#### **Academic Qualifications**

M.Sc., Computer Science, South Dakota School of Mines & Technology, USA, 2004 M.Sc., Environmental Science, Peking University, China, 2000 B.Sc., Inorganic Chemistry, Peking University, China, 1997

#### **Current Research Interests**

Using remotely sensed products in regional carbon cycling modeling, data assimilation and decision support systems, primarily applying the General Ensemble Biogeochemical Modeling System (GEMS) in ecosystems including forest, grassland and agricultural lands.

#### **Representative Paper**

Tan, Z., Liu, S., <u>Li, Z.</u>, Loveland, T.R. 2007. Simulated responses of soil organic carbon stock to tillage management scenarios in the Northwest Great Plains, *Carbon Balance and Management*, 2:7, doi:10.1186/1750-0680-2-7.



# **Erik Lindquist**

GIScCE Advisor Dr. Matthew Hansen Started Fall 2005

Academic Qualifications B.A. in Botany, Miami University, Ohio, USA, 1994

#### **Current Research Interests**

Quantifying and monitoring tropical forest cover change using high spatial resolution satellite imagery in Central Africa.

#### **Representative Paper**

Lindquist, E., Hansen, H., Roy, D.P., Justice, C.O. 2008. The suitability of decadal image data sets for mapping tropical forest cover change in the Democratic Republic of Congo: implications for the mid-decadal global land survey, *International Journal of Remote Sensing*, 29: 7269–7275.



# Luiz Mestre

GIScCE Advisor Dr. Mark Cochrane Started Fall 2007

#### Academic Qualifications

M.Sc., Ecology and Natural Resources, Federal University of Sao Carlos, Brazil, 2002 B.Sc., Biological Sciences, Federal University of Paraná, Brazil, 1998

Ph.D. Thesis Title Effects of wildfires on Amazonian bird communities

Research Interests Large scale impacts of fire on tropical forests, with an emphasis on conservation biology, biodiversity, and bird ecology in Amazonia.

# Yolande Munzimi



GIScCE Advisor Dr. Matthew Hansen Started Spring 2008

### Academic Qualifications

Master of Professional Studies, Environmental Science, Water and Wetland Resources, State University of New York College of Environmental Science and Forestry, USA, 2007 B.Sc., Agronomy, University of Kinshasa, Democratic Republic of Congo, 2000

### **Current Research Interests**

Large scale hydrological modeling and hydropower assessment of the Congo Basin using remotely sensed and hydrological time series data.

### **Representative Paper**

<u>Munzimi, Y</u>. 2008. Satellite-derived Rainfall Estimates (TRMM products) used for Hydrological Predictions of the Congo River Flow: Overview and Preliminary Results, Report of Global Change System for Analysis, Research and Training (START) and US National Science Foundation/ US Climate Change Science Program (NSF/USCCSP) visiting fellowship.



# Vincent de Paul Obade

GIScCE Advisor Dr. Matthew Hansen Started Fall 2006

Academic Qualifications M.Sc., Physical Land Resources, Ghent and Vrije University, Belgium, 2003 B.Sc., Surveying, University of Nairobi, Kenya, 1994

Ph.D. Thesis Title

Establishing the consistency and effects of land use/land cover changes on climatic patterns using multi-sensor fusion

### **Current Research Interests**

Classification feature separability analysis and evaluation of computer processing algorithms to investigate the linkages between land use/land cover and climatic changes.

### **Representative Paper**

<u>Obade Vincent de Paul.</u> 2007. Wildlife habitat suitability mapping using remote sensing and geographical information science. *African Journal of Ecology* 46, 432-434.



# **Md Shahriar Pervez**

GIScCE Advisor Dr. Geoffrey Henebry Started Fall 2006

Academic Qualifications M.Sc., Geography, University of North Dakota, USA, 2005 B.Sc., Urban and Rural Planning, Khulna University, Bangladesh, 1997

### **Current Research Interests**

Development of predictive capabilities for fresh water availability within large river basins under regional and global change scenarios and assessment of impacts on groundwater recharge within the basins.

### **Representative Paper**

Asante. K. O., Guleid A. A., <u>Pervez, S.</u>, and Rowland, J. 2008. A linear geospatial streamflow modeling system for data sparse environments. *International Journal of River Basin Management.* 6:1-9.



# Eric Ariel L. Salas

GIScCE Advisor Dr. Geoffrey Henebry Started Fall 2006

### **Academic Qualifications**

M.Sc., Geo-Information Science, Wageningen University, the Netherlands, 2002 B.Sc., Civil Engineering, University of San Carlos, Philippines, 1996

### **Current Research Interests**

Imaging spectroscopy, development and assessment of robust indices for detection of physiological changes of vegetation and vegetation water canopy retrieval.

### **Representative Paper**

Kooistra, L., E. <u>A. L. Salas</u>, J. G. P. W. Clevers, R. Wehrens, R. S. E. W. Leuven, P. H. Nienhuis, and L. M. C. Buydens. 2004. Exploring field vegetation reflectance as an indicator of soil contamination in river floodplains. *Environmental Pollution*, 127: 281-290.

# Sanath Kumar Sathyachandran



GIScCE Advisor Dr. David Roy Started Spring 2008

### **Academic Qualifications**

M.Sc., Space Studies, University of North Dakota, USA, 2007 M.Sc., Physics and Astrophysics, Delhi University, India, 1997 B.Sc., Physics (Hons), Delhi University, India, 1994

### **Current Research Interests**

Characterization of the physical properties of vegetation fires to discriminate fire type (e.g., forest, deforestation, grassland; crown, surface) from satellite observations in Australian savanna and Brazilian savanna-forest transition systems modeling fire dynamics and satellite observational biases.

### **Representative Paper**

<u>S. Kumar</u>, P.S. Hardersen, and M.J. Gaffey. 2006. Albedo estimates and near-infrared reflectance spectroscopy of near earth asteroids 1999 hf1 and 2005 ab. *Lunar and Planetary Science* XXXVII (2006).



# **Jason Stoker**

GIScCE Advisor Dr. Mark Cochrane Started Fall 2005

Academic Qualifications M.Sc., Geomatics, Colorado State University, USA, 2002 B.Sc., Natural Resource Management, Colorado State University, USA, 1997

Ph.D. Thesis Title

Evaluating Landsat and spatial aggregation of high-resolution lidar for Improved national-scale vegetative classifications

### **Current Research Interests**

Active lidar remote sensing, fusion of Lidar data with passive optical data and 3-D information representation for ecological applications.

### **Representative Paper**

<u>Stoker, J.</u>, Harding, D. and Parrish, J. 2008. The Need for a National Lidar Dataset. *Photogrammetric Engineering and Remote Sensing*, 74:1066-1068.

# Naga Manohar Velpuri



GIScCE Advisor Dr. Gabriel Senay Started Fall 2007

### **Academic Qualifications**

M.Phil, Geographic Information Systems and Remote Sensing, University of Cambridge, UK, 2005 M.Tech, Spatial Information Technology, Jawaharlal Nehru Technological University, India, 2002 B.Sc, Agriculture, Acharya N.G. Ranga Agricultural University, India, 2000

### **Current Research Interests**

Remote sensing of hydrological aspects of the terrestrial surface including the development of methods to monitor lake water height and extent, with an emphasis on the geodynamic effects of continental surface water variations on water storage estimates using Gravity Recovery and Climate Experiment (GRACE) satellite data.

### **Representative Paper**

Thenkabail, P.S., Biradar C.M., Noojipady, P., Dheeravath, V., Li, Y.J., <u>Velpuri, M.,</u> Gumma, M., Reddy, G.P.O., Turral, H., Cai, X. L., Vithanage, J., Schull, M., and Dutta, R. 2008. Global Irrigated Area Map (GIAM) for the End of the Last Millennium Derived from Remote Sensing. *International Journal of Remote Sensing*. In Press.



# Stefanie D. Wacker

GIScCE Advisor Dr. Michael Wimberly Started Fall 2006

Academic Qualifications M.Sc., Biological Sciences, South Dakota State University, USA, 2004 B.A., Geography, University of Colorado, USA, 1995 B.A., Environmental Science, University of Colorado, USA, 1995

Ph.D. Thesis Title

Understory vegetation response to timber harvest in the Black Hills National Forest, South Dakota, USA

Current Research Interests Disturbance and landscape ecology, plant invasions, biological control of plants, and spatial modeling.

### **Representative Paper**

Wacker, S. D. and J. L. Butler. 2006. Potential impact of two *Aphthona* spp. on a native, non-target *Euphorbia*. *Rangeland Ecology and Management* 59:468-474.



The GIScCE Center Scholars Program is an undergraduate academic and professional curriculum designed to enable SDSU students to gain educational and research experience and to help them qualify for a career in geographic information science.

The Program was initiated in 2006 and is coordinated by Dr. Robert Watrel of the Department of Geography. The GIScCE faculty provides mentored hands-on practicum/ internship research experience to students to help develop their spatial, analytical and critical thinking necessary for effective investigation of geographic information science/ remote sensing questions.

Student participation in the GIScCE Center of Excellence Scholars Program requires they maintain a 3.0 GPA in major coursework. The program requires each student to complete a supervised individual or team research internship and to present a paper or poster at a professional conference. The student is then required to present a professional portfolio for Center of Excellence review and approval prior to graduation.

Three years since the program's inception, its enrollment continues to increase. In its first year, 2006-2007, two students were accepted and one graduated (Audra Carson, supervisor Mike Wimberly). In its second year, 2007-2008, two students were accepted and one graduated (Roy Sando, supervisor Geoffrey Henebry).



# **Masters Students**

# **Bernard Adusei**

GIScCE Supervisor Dr. Matthew Hansen Department Geography Graduated 2006 Academic Qualifications B.A., Geography and Resource Development, University of Ghana, Ghana, 2002 Masters Thesis Title Landsat Scene Normalization using A MODIS 250 Meter Tree Cover Map

# Stephen P. Boyte

GIScCE Supervisor Dr. Michael Wimberly Department Geography Started Fall 2006 Academic Qualifications B.A., Geography, California State University, Chico, USA, 1989

Masters Thesis Title Wildfire regimes and landscape dynamics in the Black Hills, USA

# **Eugene Ochieng**

GIScCE Supervisor Dr. Matthew Hansen Department Geography Graduated 2007 Academic Qualifications B.S., Geology, University of Nairobi, Kenya, 2002 Masters Thesis Title A Medium Resolution Map of Africa

# Jodie L. Smith

GIScCE Supervisor Dr. Michael Wimberly Department Geography Started Fall 2005 Academic Qualifications B.S., Geography, South Dakota State University, USA, 2003 Masters Thesis Title Coupled Water-Balance Model for the Upper Helmand Province, Central Afghanistan

# Sarah Arnold

GISCCE Supervisor Dr. Mark Cochrane Department Geography Started Fall 2007 Academic Qualifications B.A., Business Administration, Marketing and Management, University of Sioux Falls, USA, 2005 Masters Thesis Title Changing Fire Return Intervals in Southern California

# Adam Case

GIScCE Supervisor Dr. Matthew Hansen Department Geography Graduated 2007 Academic Qualifications B.S., Geography, Manchester Metropolitan University, United Kingdom, 2004 Masters Thesis Title Forest Characterization Using Multi-Resolution Satellite Data and *In Situ* Measurements of Chequamegon National Forest in Wisconsin

# Kari L. Pabst

GIScCE Supervisor Dr. Mark Cochrane Department Geography Started Fall 2005 Academic Qualifications B.A., Biology, Augustana College, South Dakota, USA, 2005 Masters Thesis Title Remote Sensing Applications for Classifying Burn Severity of Wildland Fires in the Grand Canyon, Arizona

Note : The GIScCE does not have a Masters Program. The Masters students here are under the SDSU Geography Department and advised by GIScCE faculty.



Bernard Adusei Started: January 2007

Academic Qualifications M.Sc., Geography, South Dakota State University, USA, 2006. B.A., Geography and Resource Development, University of Ghana, Ghana, 2002.

**Current Research Interests** 

Development of automated wall to wall decision tree-based cloud and cloud-shadow mask algorithm for the humid tropical forest biome for Landsat datasets.

### **Representative Paper**

Hansen, M.C., Roy, D.P., Lindquist, E., <u>Adusei, B.</u>, Justice, C.O., and Altstatt, A. 2008. A method for integrating MODIS and Landsat data for systematic monitoring of forest covers and change in the-Congo Basin, *Remote Sensing of Environment*, 112: 2495-2513.



Adam Baer Started: June 2006

Academic Qualifications Master of Forestry, University of Missouri-Columbia, USA, 2005 B.Sc., Forestry, University of Missouri-Columbia, USA, 2003

**Current Research Interests** 

Application of GIS and spatial simulation models to assess fuel treatment effectiveness in the United States. Spatial analysis and mapping of vector-borne disease risk.

**Representative Paper** 

Wimberly, M.C., <u>Baer, A.D.</u>, and Yabsley, M.J. 2008. Enhanced spatial models for predicting the geographic distributions of tick-borne pathogens. *International Journal of Health Geographics*, 7(15).



Kyle Pittman Started: May 2005

**Academic Qualifications** 

M.A., Geography, University of Maryland-College Park, USA, 2004 B.Sc., Geography, University of Maryland-College Park, USA, 2002 Bachelor of Business Administration, Information & Operation Systems, Texas A&M University, USA, 2001

Current Research Interests The use of data mining techniques in large-scale mapping of cropland areas, forest cover and forest change.

### **Representative Paper**

Hansen, M.C., S.V. Stehman, P.V. Potapov, T.R. Loveland, J.R.G. Townshend, R.S. DeFries, <u>K. Pittman</u>, B. Arunarwati, F. Stolle, M.K. Steininger, M. Carroll and C. DiMiceli, 2008. Humid tropical forest clearing from 2000 to 2005 quantified by using multitemporal and multiresolution remotely sensed data, *PNAS* 105(27):9439-9444.



# Claudia Cochrane Research Coordinator

Claudia Cochrane has a BA in English from "Centro de Ensino Unificado de Brasilia" in Brasilia, Brazil and an MA in Economics from The Pennsylvania State University in State College, PA. She started working with financial management at the United Nations Development Program in Brasilia, Brazil, and with research administration at Michigan State University. She is responsible for the financial management of all research and internal accounts at the GISc Center of Excellence.



## Marcia Prouty Administrator

Marcia has a BA in Secondary Education (Speech/Debate) from Augustana College in Sioux Falls, South Dakota plus some graduate education from various other universities. She has a teaching background plus has worked in various offices, mostly in the medical or education fields.





# Anil Kommareddy Research Engineer

Anil has a B.E. Degree from University of Madras in Electrical and Electronics Engineering and is pursuing his Ph.D. in Agricultural Engineering at South Dakota State University. Anil has extensive experience integrating computer systems. On the software side he develops scientific applications as deemed necessary for the department's research. He also helps in troubleshooting and guiding the department's graduate students and post-docs on existing/developing software applications and programs. Anil's computer hardware experience spans designing, planning, implementing and administering: Storage Area Networks, Web servers, Database servers, Internet Protocol Networks, Linux Application servers and Windows Desktops.



The following staff and faculty left the GIScCE to retire or take up positions elsewhere in the previous three years.

### Dr. Kwabena Asante

Research Physical Scientist, USGS EROS, Adjunct Professor, GIScCE SDSU, 2005–2007, became an Independent Consultant, Climatus LLC, Mountain View, California, USA.

Dr. Kirsten de Beurs

Post-doctoral fellow, GIScCE SDSU, 2006, took up an Assistant Professorship, Department of Geography, Virginia Tech., VA, USA.

### Marcela Doubková

Geospatial Analyst, GIScCE SDSU, 2006-2007, became a Geospatial Analyst, Technical University of Vienna, Austria.

### Dr. Bingxuan Guo

Post-doctoral fellow, GIScCE SDSU, 2008, took up a post-doctoral position at George Mason University, VA, USA.

### JoAnn Jorgensen

Senior Secretary, 2005–2008, Retired.

### Dr. Zhe Li

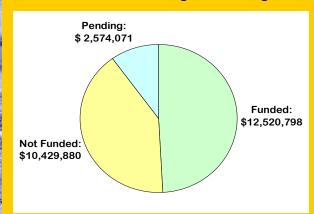
Post-doctoral fellow, GIScCE SDSU, 2007–2008, took up a post-doctoral position, East-West Center, Hawaii, USA.

Dr. Xiaolei Wang Post-doctoral fellow, GIScCE SDSU, 2008, took up a post-doctoral position at the University of Oklahoma.

# Dr. Zhiliang Zhu

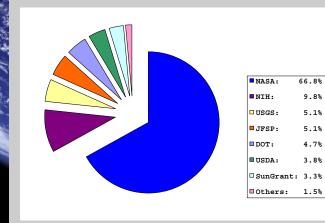
Research Physical Scientist, USGS EROS, Adjunct Professor, GIScCE SDSU, 2005–2007, took up a Federal Government position, USGS, Reston, VA, USA.

From August 2005 to December 2008 the center faculty submitted \$25,524,749 in proposals and secured \$12,520,792 in research funds routed through South Dakota State University. The majority of the research funds are from the National Aeronautics and Space Administration (NASA), but nearly one third are from other sources including the National Institutes of Health (NIH), the United States Geological Survey (USGS), the Joint Fire Science Program (JFSP), the Department of Transportation (DOT), the United States Department of Agriculture (USDA), the Sun Grant Initiative, the National Science Foundation (NSF), the Department of Energy (DOE), and the United Nations Food and Agriculture Organization (FAO).



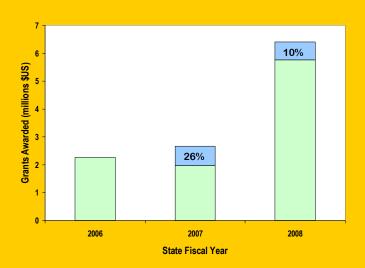
Pie chart illustrating percentages (by US dollar) of research proposals submitted, funded and pending.

In the last three fiscal years the research funding has increased from \$2.26 million awarded in 2006 to \$6.41 million awarded in 2008. In this period the smallest grant was a one year SDSU Griffith Foundation \$2,500 award for undergraduate research and the largest was a NASA funded project on MODIS-Landsat satellite data fusion for \$3,288,041 over five years. Of the awarded amounts in FY '07 and FY '08, 74% and 90% were for competitive grants and the remainder 26% and 10% respectively were non competitive projects funded by the Sun Grant initiative, USGS, FAO, Conservation International, USDA Forest Service, National Science Foundation, and the SDSU Griffith Foundation.



Pie chart illustrating source of research grant funding.

The funded research has included collaborations with a variety of academic institutions including the University of Maryland, Boston University, the State University of New York, the University of Virginia, the University of Nebraska, Hobart and Smith Colleges, the University of Louisville, South Dakota School of Mines and Technology, Grand Valley State University, and the Instituto do Homem e Meio Ambiente da Amazonia. The Center faculty have completed 19 externally funded projects, has 28 projects in progress, and is awaiting funding decisions on 9 proposals.



Funded research grants by fiscal year (purple shows the percentage on non-competitive grants).

The GIScCE research portfolio and grants administration is coordinated by Claudia Cochrane.

GIScCE Research Funding

Ph.D. Student Fellowships



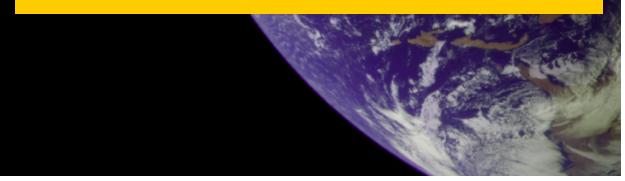
The following four students were awarded prestigious NASA Earth and Space Science Ph.D. Fellowship grants. The purpose of the NASA fellowship is to ensure continued training of interdisciplinary scientists to support the study of the Earth as a system. The student applications were evaluated through a two-step process: first through mail review, and then by a panel composed of members of academic institutions and research organizations as well as program managers at NASA Headquarters. NASA selects nationally only approximately 55 students each year for these highly competitive fellowships.

**Chris Barnes** (advisor Dr. David Roy) was awarded a NASA Earth and Space Science Ph.D. Fellowship grant starting 2006/2007 for his proposal titled, "*United States Land Cover Land Use Change, Albedo and Radiative Forcing: Past and Potential Climate Implications*".

Amadou Dieye (advisor Dr. David Roy) was awarded a NASA Earth and Space Science Ph.D. Fellowship grant starting 2007/2008 for his proposal titled, "Land Cover Land Use Change and Soil Organic Carbon Under Climate Variability in Semi-Arid to Sub-Humid West African Sahel (1975-2050)".

**Erik Lindquist** (advisor Dr. Matt Hansen) was awarded a NASA Earth and Space Science Ph.D. Fellowship grant starting 2007/2008 for his proposal titled, "*Using MODIS and Landsat data to advance regional, high-spatial resolution change monitoring for the humid tropical forests of the Congo Basin*".

**Chris Barber** (advisor Dr. Mark Cochrane) was awarded a NASA Earth and Space Science Ph.D. Fellowship grant starting 2008/2009 for his proposal titled "*Applied Remote Sensing for Conservation Monitoring*".



**GIScCE** Computer Resources

The GIScCE has nationally competitive computing resources, run off a six node high availability Linux cluster with 1 Gbps Intranet connectivity. A dedicated web server is connected to the campus network and to USGS EROS and all Federal and US academic institutions on a 10Gbps network. The GIScCE currently has the largest data storage and processing capacity on campus, primarily used to store and manipulate MODIS and Landsat satellite data. Eight data processing servers are connected to 240TB of RAID storage via a high speed 4Gbps fiber optic network. Each of the faculty, research staff and graduate students has individual Linux and/or Windows workstations, and numerous

GIS, statistical and remote sensing packages are supported. The GIScCE computing

Computers are integral to the research of the center.

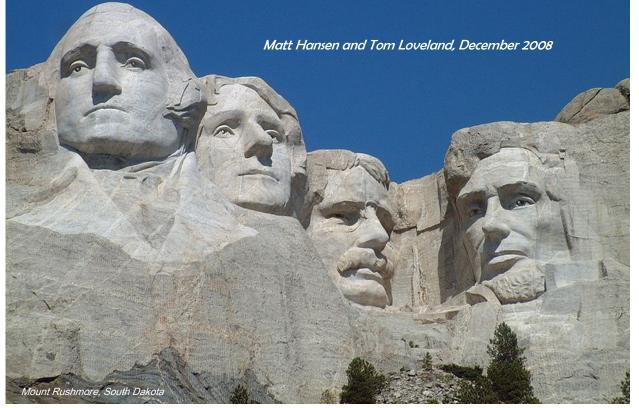
resources are coordinated by Anil Kommareddy.



# Looking Forward

As the GIScCE looks forward, we expect to pass new milestones. Our first cohort of Ph.D. students from the Geospatial Science and Engineering program are expected to graduate in the next three years. A key function of any research institution is to train the next generation of scientists. Our success in preparing students will be demonstrated by their entry into professional capacities in government, educational or non-governmental organizations, and the private sector. Another milestone concerns the adaptation of methods derived at the GISCCE by operational partners. Because the GIScCE is a partnership between SDSU and the USGS, we are particularly excited about our role in advancing USGS operational land monitoring capabilities. The recent opening of the USGS Landsat archive to free access should revolutionize large-area environmental monitoring; the collaborative research underway at the GIScCE will serve as a foundation for that revolution. We also have research projects in collaboration with USDA, NIH, and the UNFAO, all with the goal of enhancing the operational capacities of these organizations. Porting results to operational environments is an important validation of the initial ideas proposed and examined through grant funded research. Successes in this area will also spread the word that the GIScCE is home to innovative and robust research that has practical application to the wider community. Another milestone can be arbitrarily defined: in the next three years we will expend more than \$10,000,000 in federal grant monies in support of our GIScCE research. This value signifies the competitive talents of our faculty in garnering awards as well as the larger impact such awards have in bringing external resources to SDSU, Brookings, and the State of South Dakota. The nature of remote sensing research does not dictate that it need be performed in any specific place. We can be as competitive here in South Dakota as we can be anywhere else. Our success to date is evidence of that.

The combined support of the GIScCE faculty and staff, the SDSU and USGS administrations, the State of South Dakota Board of Regents, the people of South Dakota, and our federal funding agencies, have enabled our initial successes and now provide the impetus for achieving these new milestones. We look forward to doing so.



# **Refereed Journal Articles 2008**

Aguilar-Amuchastegui, N., and **Henebry, G.M.** 2008. Characterizing tropical forest spatio-temporal heterogeneity using the Wide Dynamic Range Vegetation Index (WDRVI), *International Journal of Remote Sensing*, 29: 7285-7291.

**Barnes, C.A.** and **Roy, D.P**. 2008. Radiative forcing over the conterminous United States due to contemporary land cover land use albedo change, *Geophysical Research Letters*, 35:L09706, doi:10.1029/2008GL033567.

Boschetti, L. and **Roy, D.P.** 2008. Defining a fire year for reporting and analysis of global inter-annual fire variability, *Journal of Geophysical Research*, 113: G03020, doi:10.1029/2008JG000686.

Boschetti, L., **Roy**, D.P. and Justice, C. 2008. Using NASA's World Wind Virtual Globe for Interactive Visualization of the Global MODIS Burned Area Product, *International Journal of Remote Sensing*, 29 (11): 3067-3072.

Boschetti, L., **Roy, D.P**., Barbosa, P., Boca, R., Justice, C. 2008. A MODIS assessment of the summer 2007 extent burned in Greece, *International Journal of Remote Sensing*, 29: 2433 – 2436.

Chen, M., Liu, S., Tieszen, L.L. and Hollinger, D.Y. 2008. An improved state-parameter analysis of ecosystem models using data assimilation. *Ecological Modelling*, 219: 317-326

**Cochrane, M.A.** and Laurance, W.F. 2008. Synergisms Among Fire, Land Use, and Climate Change in the Amazon. *Ambio* 37:5222-527.

de Beurs, K.M., and **Henebry, G.M**. 2008. War, drought, and phenology: Changes in the land surface phenology of Afghanistan since 1982, *Journal of Land Use Science*, 3(2-3): 95-111.

de Beurs, K.M., and **Henebry, G.M.** 2008. Northern Annular Mode effects on the land surface phenologies of Northern Eurasia, *Journal of Climate*, 21: 4257-4279.

Hale, R.C., **Gallo, K.P.** and **Loveland, T.R.** 2008. Influences of specific land use/land cover conversions on climatological normals of near-surface temperature. *Journal of Geophysical Research*, 113: D14113, doi:10.1029/2007JD009548.

Hansen, M.C., Roy, D.P., Lindquist, E., Adusei, B., Justice, C.O., Altstaat, A. 2008. A method for integrating MODIS and Landsat data for systematic monitoring of forest cover and change and preliminary results for Central Africa, *Remote Sensing of Environment*, 112: 2495-2513.

Hansen, M.C., Shimabukuro, Y., Potapov, P., and Pittman, K. 2008. Comparing annual MODIS and PRODES forest cover change data for advancing monitoring of Brazilian forest cover, *Remote Sensing of Environment*, 112: 3784-3793.

Hansen, M. C., Stehman, S. V., Potapov, P. V., Loveland, T. R., Townshend, J. R. G., DeFries, R. S., Arunarwati, B., Stolle, F., Steininger, M., Carroll, M., and DiMiceli, C. 2008. Humid tropical forest clearing from 2000 to 2005 quantified using multi-temporal and multi-resolution remotely sensed data, *Proceedings of the National Academy of Sciences*, 105: 9439-9444.

Harden, J W, Berhe, A.A., Torn, M., Harte, J., Liu, S., Stallard, R.F. 2008. Soil erosion: data say C sink. *Science* 320 (April): 178-179.

Herold, M., Woodcock, C.E., **Loveland, T.R**., Townshend, J., Brady, M., Steemans, C., and Schmullius, C.C. 2008. Land cover observations as part of a Global Earth Observation System of Systems (GEOSS): progress, activities, and prospects, *IEEE Systems Journal*, 2(3): 414-423.

Ji, L., Gallo, K., Eidenshink, J.C. and J. Dwyer. 2008. Agreement evaluation of AVHRR and MODIS 16-day composite NDVI data sets. *International Journal of Remote Sensing*, 29(16): 4839-4861, doi: 10.1080/01431160801927194.

Joeckel, R.M., and **G.M. Henebry**. 2008. Channel and Island Change in the Lower Platte River, Eastern Nebraska, USA: 1855-2005. *Geomorphology*, 102(3-4):407-418.

Ju, J. and Roy, D.P. 2008. The availability of cloud-free Landsat ETM+ data over the conterminous United States and globally, *Remote Sensing of Environment*, 112:1196-1211.

Kodandapani, N., **Cochrane, M.A.** and R. Sukumar. 2008. A comparative analysis of spatial, temporal, and ecological characteristics of forest fires in seasonally dry tropical ecosystems in the Western Ghats, India. *Forest Ecology and Management* 256: 607-617.

**Lindquist, E., Hansen, H., Roy, D.P.,** Justice, C.O. 2008. The suitability of decadal image data sets for mapping tropical forest cover change in the Democratic Republic of Congo: implications for the mid-decadal global land survey, *International Journal of Remote Sensing*, 29: 7269–7275.

Liu, J., Liu, S., Loveland, T.R., Tieszen, L.L. 2008. Integrating Remotely Sensed Land Cover Observations and a Biogeochemical Model For Estimating Forest Ecosystem Carbon Dynamics. *Ecological Modelling* 219: *361-372*, doi:10.1016/j.ecolmodel.2008.04.019.

Liu, S, Anderson, P., Kauffman, B., Hughes, F., Schimel, D., Zhou, G., Watson, V. and Tosi, J. 2008. Resolving Model Parameter Values From C and N Stock Measurements in a Wide Range of Tropical Mature Forests Using Nonlinear Inversion and Regression Trees. *Ecological Modelling* 219: 327-341.

Loveland, T.R., Cochrane, M.A., and Henebry, G.M. 2008. Landsat still contributing to environmental research. *Trends in Ecology and Evolution* 23: 162-163.

Potapov P., Hansen M. C., Stehman S. V., Loveland T. R., Pittman K. 2008. Combining MODIS and Landsat imagery to estimate and map boreal forest cover loss, *Remote Sensing of Environment*, 112: 3708-3719.

**Roy, D.P.**, Boschetti, L., Justice C.O., **Ju, J.** 2008. The Collection 5 MODIS Burned Area Product – Global Evaluation by Comparison with the MODIS Active Fire Product, *Remote Sensing of Environment*, 112: 3690–3707.

Roy, D.P., Ju, J., Lewis, P., Schaaf, C., Gao, F., Hansen, M., Lindquist, E. 2008. Multi-temporal MODIS-Landsat data fusion for relative radiometric normalization, gap filling, and prediction of Landsat data, *Remote Sensing of Environment*, 112: 3112-3130, doi 10.1016/j.rse.2008.03.009.

Senay G.B. 2008. Modeling Landscape Evapotranspiration by Integrating Land Surface Phenology and a Water Balance Algorithms. 1(2):52-68.

Senay, G. B., Verdin, J.P., Lietzow, R. and Melesse, A.M. 2008. Global daily reference evapotranspiration modeling and evaluation, *Journal of American Water Resources Association*, 44(4): 969–979. DOI:10.1111/ j.1752-1688.2008.00195.

Tadesse, T., Haile, M., **Senay, G.B.**; Wardlow, B., Knutson, C.L. 2008. The need for integration of drought monitoring tools for proactive food security management in sub-Saharan Africa, *Natural Resources Forum*, 32 (4):265-279.

Wimberly, M. C., Baer, A. D., Yabsley, M. J. 2008. Enhanced spatial models for predicting the geographic distributions of tick-borne pathogens. *International Journal of Health Geographics*, 7:15.

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Wimberly, M. C., and Kennedy, R. S. H. 2008. Spatially explicit modeling of mixed-severity fire regimes and landscape dynamics in the interior Pacific Northwest. *Forest Ecology and Management*, 254: 511-523.

Wimberly, M. C., Yabsley, M. J., Baer, A. D., Dugan, V. G., Davidson W. R. 2008. Spatial heterogeneity of climate and land cover constraints on distributions of tick-borne pathogens. *Global Ecology and Biogeography*, 17: 189-202.

Wulder, M.A., White, J.C., Goward, S.N., Masek, J.G., Irons, J.R., Herold, M., Cohen, W.B., Loveland, T.R. and Woodcock, C.E. 2008. Landsat continuity: issues and opportunities for land cover monitoring. *Remote Sensing of Environment*, 112: 955-969.

Zhou, G., Guan, L., Wei, X., Tang, X., Liu, S., Liu, J., Zhang, D., and Yan, J. 2008. Factors influencing leaf litter decomposition–an intersite decomposition experiment across China: *Plant and Soil*, v. In Press, p. 1-12.

# **Refereed Journal Articles 2007**

Achard F., DeFries, R., Eva, H., Hansen, M., Mayaux, P., Stibig, H-J. 2007. Improved pan-tropical observations and mid-resolution monitoring of deforestation, *Environmental Research Letters*, 2: 11.

Aguilar-Amuchastegui, N., and **Henebry, G.M.** 2007. Assessing sustainability indicators for tropical forests: spatio-temporal heterogeneity, logging intensity, and dung beetle communities, *Forest Ecology and Management*, 253:56-67; doi:10.1016/j.foreco.2007.07.004

Arima, E.Y., Simmons, C.S., Walker, T.T. and **Cochrane**, **M.A.** 2007. Fire in the Brazilian Amazon: A Spatially Explicit Model for Policy Impact Analysis. *Journal of Regional Science* 47: 541-567.

Chang, J., Hansen, M.C., Pittman, K., Dimiceli, C., and Carroll, M. 2007. Corn and soybean mapping in the United States using MODIS time-series data sets, *Agronomy Journal*, 1654-1664.

Liu, H., Tang X., Zhou G., Liu S. 2007. Spatial and Temporal Patterns of Net Primary Productivity in the Duration of 1981-2000 in Guangdong, China. *Acta Ecologica Sinica*, 27: 4065-4074

Manangan, J. S., Schweitzer, S. H., Nibbelink, N., Yabsley, M. J., Gibbs, S. E. J., and **Wimberly, M. C.** 2007. Habitat factors influencing distributions of *Anaplasma phagocytophilum* and *Ehrlichia chaffeensis* in the Mississippi Alluvial Valley. *Vector-Borne and Zoonotic Diseases*, 7: 563-574.

Matricardi, E.A.T., D.L. Skole, D.L., Cochrane, M.A., Pedlowski, M. and Chomentowski, W. 2007. Multitemporal Assessment of Selective Logging in the Brazilian Amazon Using Landsat Data. *International Journal of Remote Sensing*, 28: 63-82.

Melesse, A., Weng, Q., Thenkabail, P., Senay, G.B. 2007. Remote Sensing Sensors and Applications in Environmental Resources Mapping and Modeling, *Sensors*, 7: 3209-3241.

Messina, J.P. and **Cochrane**, **M.A.** 2007. The Forests are Bleeding: How Land Use Change is Creating a New Fire Regime in the Ecuadorian Amazon. *Journal of Latin American Geography*, 6: 85-100.

Myneni, R.B., Wenze Yang, W., Nemani, R.R., Huete, A.R., Dickinson, R.E., Knyazikhin, Y., Didan, K., Fu, R., Negrón Juárez, R.I., Saatchi, S.S., Hashimoto, H., Ichii, K., Shabanov, N.V., Tan, B., Ratana, P., Privette, J.L., Morisette, J.T., Vermote, E.F., **Roy, D.P**., Wolfe, R.E., Friedl, M.A., Running, S.W., Votava, P., Saleous, N., Devadiga, S., Su, Y., Salomonson, V.V., 2007, Large Seasonal Swings in Leaf Area of Amazon Rainforests, *Proceedings of the National Academy of Sciences*, March 20, 2007 vol. 104 no. 12: 4820-4823.

Nonaka, E., Spies, T. A., **Wimberly, M. C.**, and Ohmann, J. L. 2007. Historical range of variability (HRV) in live and dead wood biomass: a regional-scale simulation study. *Canadian Journal of Forest Research*, 37: 2349-2364.

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# Cool faculty research and locations The Brazilian Amazon

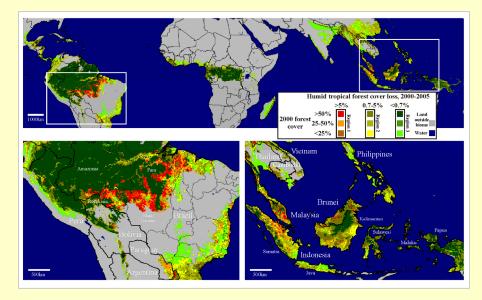
Dr. Cochrane has conducted research in the Brazilian Amazon since 1995. His work concentrates on the synergy and interactions between multiple land uses, disturbances and land cover changes. The image below illustrates landscape dynamics in a Landsat scene of Mato Grosso, the dark green is intact forest, tan is deforested land, blue is water, light green and red are forests that have been logged and burned, respectively, over a 10 year period. Fire, fragmentation and selective logging all impact remaining forests and interact to rapidly degrade the function of these remnants.



The Brazilian Amazon is home to 20 million people including many indigenous peoples. In recent decades extensive deforestation has occurred as settlers have tried to establish agriculture and extractive practices. While forest degradation and removal is happening rapidly, the Brazilian federal government has also established extensive National Forests and National Parks and individual states have also established conservation lands. At present, nearly 50% of the Brazilian Amazon has protected status that disallows deforestation (this includes Indigenous lands which comprise 26% of the region).

# Cool faculty research and locations Brazil and Indonesia

Since 1998 Dr. Hansen has been undertaking research on monitoring forest cover change at regional and global scales. The figure at top provides an internally consistent depiction of forest cover loss within the humid tropics from 2000 to 2005.



In Brazil and Indonesia, agro-industrial interests lead to dramatic large-scale removal of intact forests, with an example from Indonesia, lower left. Here, oil palm plantations have replaced old growth forest. Local populations also exploit intact forests in the form of small-scale farming, seen bottom left in the Democratic Republic of Congo. Improved methods for monitoring forest change are an objective of Dr. Matt Hansen's research. His team that focuses on forest cover change includes Dr. Peter Potapov, Dr. Svetlana Turubanova, Erik Lindquist, Mark Broich, Bernard Adusei and Kyle Pittman.

Work in collaboration with the Ministry of Forestry of Indonesia has led to training Ministry staff in multi-sensor, targeted sampling methods for monitoring forest cover and change. Results have been presented to the Ministry, seen in the photo at bottom right. Belinda Arunarwati

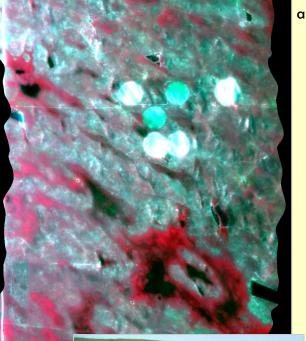


of the Ministry, bottom row at right, who will be attending SDSU in pursuit of a doctoral degree.

# Cool faculty research and locations The Sandhills of Nebraska

Since 2002 Dr. Henebry has been part of a team investigating the stability and resilience of the largest dunefield in North America: the Sandhills of Nebraska.

A 2008 image from the AISA airborne imaging spectrometer shows the 120m diameter experimental plots the Grassland Destabilization Experiment—a landscape manipulation to study surface radiation and energy balances, dune mobility, and revegetation dynamics. White is bare sand, cyan is dead vegetation, red is live vegetation, and the dark areas are either areas of ephemeral wetlands or planted stands of conifers. The upper right photo illustrates sand migration following a few years of continual devegetation.

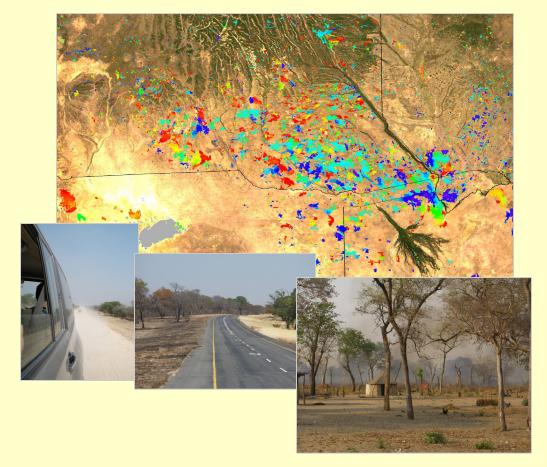




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# Cool faculty research and locations Southern Africa

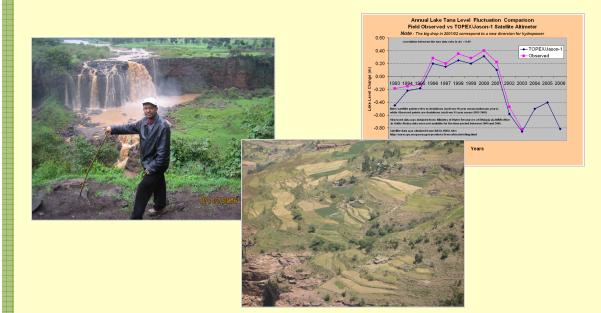
Dr. Roy has been working on NASA funded satellite fire mapping projects in Africa since 2000, and over this time has supported the development of the Southern Africa Fire Network (SAFNet), a regional network of the Global Observations of Forest Cover – Global Observations of Land Dynamics Fire initiative. The SAFNet seeks to fosters collaborative efforts in fire monitoring and management in southern Africa to achieve more effective and appropriate fire management policies and practices through the use of remote sensing and other geospatial information technology. The main image below shows one month of burned areas mapped by the MODIS burned area product. The burns are displayed using a rainbow color scale according to the detection date September 1st (blue) to September 30th (red) and are shown superimposed on a true color MODIS surface reflectance composite to provide geographic context. Scale: 1200\*750km, the black lines show country borders: Angola (N.W.), Zambia (N.E), Botswana (S.E.), Namibia (S.W). The Okavango Delta (Botswana) is clearly apparent to the south of the Caprivi Strip (Namibia).



Dr. Roy gave a training course at the 7th SAFNET Workshop, Katima Mulilo, Namibia, 22-26th September 2008. The photographs show meeting pictures taken in the Caprivi Strip, north of the Okavango Delta.

# Cool faculty research and locations The Blue Nile River Basin

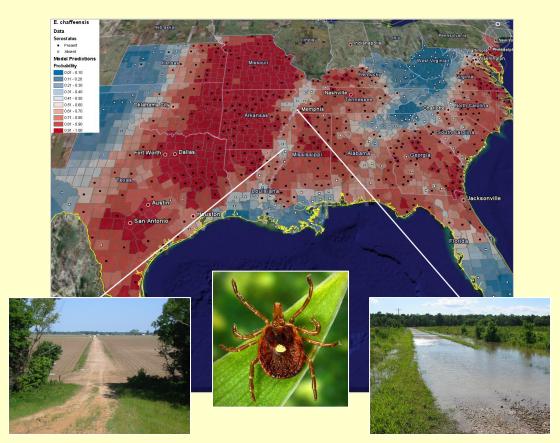
Dr. Senay has been to the highlands of Ethiopia as part of a field trip on an NSF funded project to study the eco-hydrology of the Upper Blue Nile Basin. The Nile River system is regarded as one of the most important ecohydrologic systems of the world. Although the freshwater volume carried by the Nile corresponds to a small fraction of the Amazon (2%), Mississippi (15%) and Mekong (20%) Rivers, its diverse ecological richness, history, mosaiced landscape makes it unique and a valuable resource to the basin countries. The basin is home for over 160 million people in ten riparian countries providing basic livelihoods for agriculture, fishing, tourism, recreation, power generation and domestic water supply. Studies have shown that the river system has experienced fluctuations in seasonal and annual flows and, in some watersheds, a decline in dry season flows. This is mainly driven by impacts of the erratic and unpredicted changes in climate variables, undesirable changes in land-use on hydrologically sensitive segments of the river system. Moreover, with increasing demand in the region for more water, land and soil resources, extreme climatic events and climate change will make sustenance challenging.



Despite its contribution to the Nile flow system, the Blue Nile River basin suffers from little or incomplete data covering the hydrologic and hydraulic aspects of the river and streams. Studies are either limited to large scale flow analysis or incomplete. The resilience of the system to shocks of land use alterations, precipitation variability in timing and volume, changes in air temperature, sediment fluxes to Lake Tana need to be studied. The chart illustrates the vulnerability of the Blue Nile Falls (also known as Tisisat Falls shown in the photo) and its ecology to dams and diversion structures due to changes in the flow volume and dynamics. A typical landscape scene on the upper Blue Nile region is also shown.

# Cool faculty research and locations The Macroscope Meets the Microscope

Dr. Wimberly recently completed a research project examining the biogeography of tick-borne diseases in the southeastern United States. The research linked serological surveys of two emerging tick-borne pathogens with geospatial data on climate and land cover patterns to map the geographical ranges of the pathogens and provide a regional perspective on disease risk.



A Google Earth map of *Ehrlichia chaffeensis*, the causative agent of human monocytotropic ehrichiosis, is displayed above. The red areas in this map have the highest probability of pathogen occurrence in sentinel deer herds. Another component of this project focused on the landscape ecology of tick-borne diseases in the Mississippi Delta, which is characterized by highly fragmented forests and frequent flooding. Current research in this area is examining the effects of physical and social environments on patterns of obesity in the United States, the landscape ecology and epidemiology of West Nile virus in the Northern Great Plains, and the development of an environmental early warning system for Malaria in the highlands of Ethiopia.

# Cool faculty research and locations Unmanned Aerial Vehicle (UAV)

Dr. Zhang recently worked on a project supported by the US Department of Transportation to develop a digital

imaging system for efficiently monitoring the condition of transportation infrastructure.

The research includes the design of an Unmanned Aerial remote sensing system (right) and investigation of the potential of UAV-acquired imagery for infrastructure inventory and road condition information extraction

using state of the art digital photogrammetric techniques.

A prototype helicopter UAV with airborne camera has been used to acquire imagery over roads near the SDSU campus.

Typical high spatial resolution UAV images are shown below and are well suited for both man made (left) and natural (right) road condition assessment.



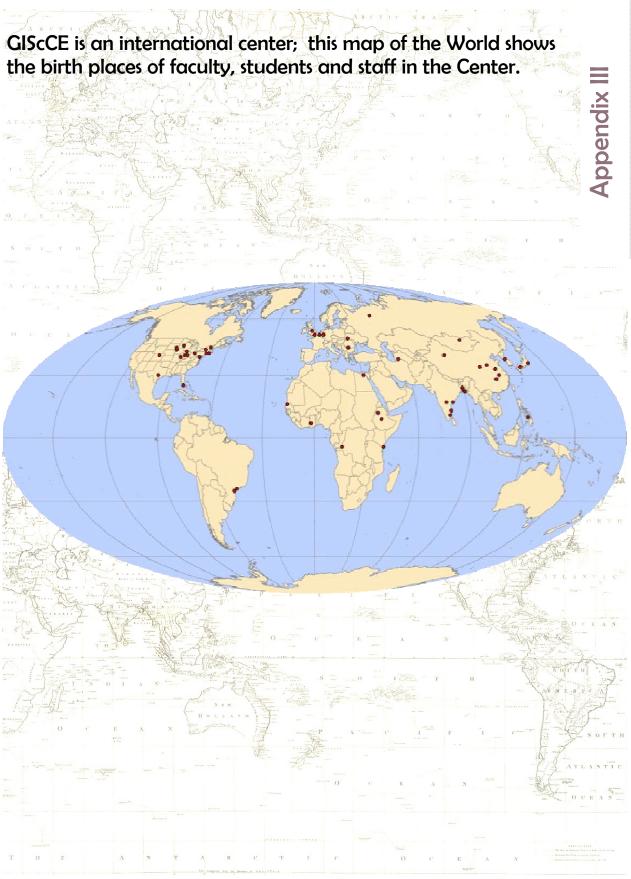








spatial resolution UAV images are s (left) and natural (right) road condi



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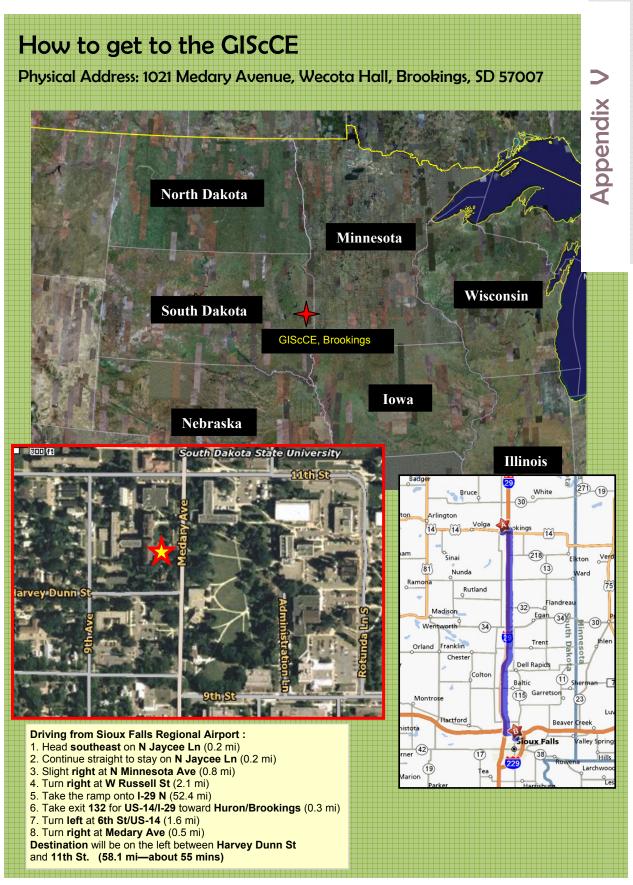
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