UNIVERSITY OF MARYLAND

Department of Geographical Sciences

DEPARTMENT OF Geographical Sciences
BE GLOBAL

COLLEGE OF BEHAVIORAL & SOCIAL SCIENCES
THE SOLUTION

Summer 2015

GEOGRAFFITI

INSIDE

Testudo on his perch in front of McKeldin Library.

View from the Chair, Christopher Justice

The state budget shortfall and the necessity to maintain the bond-rating for the University of Maryland System came into the spotlight at the beginning of the semester and resulted in a furlough for state employees, a freeze on hiring and discretionary spending and cuts in the department's state budget. The faculty has taken all of this in its stride and our front office staff has been keeping the trains running in the face of unprecedented budget uncertainty and a significant increase in paperwork associated with use of state funds. Despite these difficulties, we have had a very productive semester. We are graduating 65 undergraduates, 36 master's students and 10 Ph.D. students. I continue to be impressed with the outstanding level of scholarship of our Ph.D. students, who are publishing in highly ranked journals. The faculty has continued to compete for external research funding, which has increased by nearly 50% since 2008. We received permission to send some of our graduate students to the Annual Meeting of the Association of American Geographers in Chicago, which provides an important professional networking experience for them. We are continuing to develop our Center for Geospatial Information Science and although a new building is very much needed for our expanding Department, it is unlikely to be forthcoming given the current budget climate, so we are looking into the feasibility of renovating some of our existing space in Le Frak Hall to create a combined teaching and research facility for GIS.

This semester, Sam Goward and John Townshend, both former Department Chairs, retired. Together, they laid the foundation and built the outstanding Department that we have today. I would like to thank them both for their leadership and commitment to the success of the Department and their substantive contribution to the discipline of satellite remote sensing. I am asking Dean Ball to help fill the gaping [continued on p. 2]

View from the Chair, continued....

hole that their departure leaves with two replacement hires. These will be very hard shoes to fill but will be needed to retain our leadership in this research area, which has been so important to the success and reputation of the Department. In the last couple of weeks, we received the good news from President Loh that the hiring freeze will be lifted and that Governor Hogan has decided to give back the cost of living adjustment that was rescinded earlier in the year. I would also like to congratulate Shannon Bobbitt who recently received the BSOS Staff Award for her service to the Department. This all brings the semester to a close on a positive note and we are all looking forward to our summer research and starting again in the Fall.

Words from the Research Director, George Hurtt

The Earth just passed through the hottest January-April on record, placing 2015 on track to being hottest year globally since modern record keeping began. Within this global context, the spatial patterns and complexities of changes continue to manifest, and are at the core of Geographical Sciences research. For example, despite the global trend, relatively cooler temperatures have occurred in some limited areas, while record setting heat has occurred in others; a recent heat wave in India, for example, has killed over 1000 people. Droughts of water are occurring in the U.S. West, while a disaster of a different kind, namely intense land falling hurricanes (Cat 3+), is occurring in the East. International climate policy discussions are accelerating toward Paris, where countries are scheduled to make voluntary commitments to reduce greenhouse gas emissions. More broadly, the international community is headed towards finalization of a set of 17 Sustainable Development Goals later this year. Against this backdrop, GEOG research continues to grow in both volume and impact. Recent research highlights span both physical and human dimensions of Geography. For example, a recent study showed that night lights over Syria have been reduced by 85% due to the recent conflict (Li). Tropical forest loss and damage is accelerating, not declining as previously thought (Ki, Townshend, Sexton). Water transfers across China were studied from the perspective of alleviating water stress (Hubacek), and urbanization could save up to 25% of global energy use by 2050 (Baiocchi). Moving forward, the next Coupled Model Intercomparison Project (CMIP6) and Intergovernmental Panel on Climate Change (IPCC) activities are ramping up with GEOG involvement and leadership. The NASA-UMD Joint Global Carbon Cycle Center continues to advance, and the new GIS Center is just taking off. Research and education are intimately linked. The department recently celebrated the graduation of 10 Ph.Ds. (Dodson, Duncanson, Huang, Montano, Montesano, Shi, X. Song, Tang, Tao, Tyukavina) and is finding new ways to engage undergraduates in real world research (see separate article on NASA-CMS this issue). Our success is due foremost to our people. Five faculty members were recently honored at the 8th Annual University-Wide Celebration of Scholarship and Research (Baiocchi, Dubayah, Hansen, Hurtt, Justice). Our Research Faculty, the best in the world, is growing and now total 84 members! Two of these faculty members were recently recognized with department awards for Outstanding Research Professor (Feng), and Outstanding Faculty Research Assistant (O'Bannon). Finally, I'd like to welcome two new additions to the Research Faculty, Varaprasad Bandaru and Molly Brown, and offer our best wishes for continued success to departing members Khaldoun Rishmawi, Tao He and Huiran Jin.

AgriSense-Africa/STARS Tracks Impact of Late Rains on Crops in Central and Northern Tanzania

The vast majority of Tanzania's population depends on subsistence agriculture for survival. Large parts of northern Tanzania are among the lowest producing areas in the country due to low and unreliable rainfalls. Monitoring crop conditions for food security is largely hampered in the country due to the low capacity and high costs associated with traditional methods of data collection. However, with remote sensing technology the University of Maryland is revolutionizing agriculture monitoring in Tanzania through the AgriSense-Africa STARS (Spurring a Transformation for Agriculture through Remote Sensing) Project.

A primary goal of AgriSense-Africa is developing and providing remote sensing observation tools in combination with new tools for field data collection to the Ministry of Agriculture, Food and Cooperatives of Tanzania (MAFC) whilst building capacity to use them. The novelty of AgriSense-Africa's tools and methods are already being appreciated at MAFC. One of the tools is the GLAM-East Africa system, which provides satellite remote sensing observations from the MODIS sensor for tracking and monitoring crop conditions. Customized for Tanzania, GLAM-East Africa showed unusually poor vegetation conditions in central and northern Tanzania (Figure A) one month into the main growing season due to delayed rains. Figure B shows a UAV overflight image from March 18, 2015 over one of AgriSense-Africa's study sites in Same District in northern Tanzania, showing bare earth and only limited amounts of dry-planted fields.

Below-normal crop conditions and late development due to the delayed start of the rains are evident in the other regions across the country including Singda, Arusha, Simuyu and Morogoro and as such, the MAFC prospects of good harvest for the affected regions are low for this [Continued on p. 4]

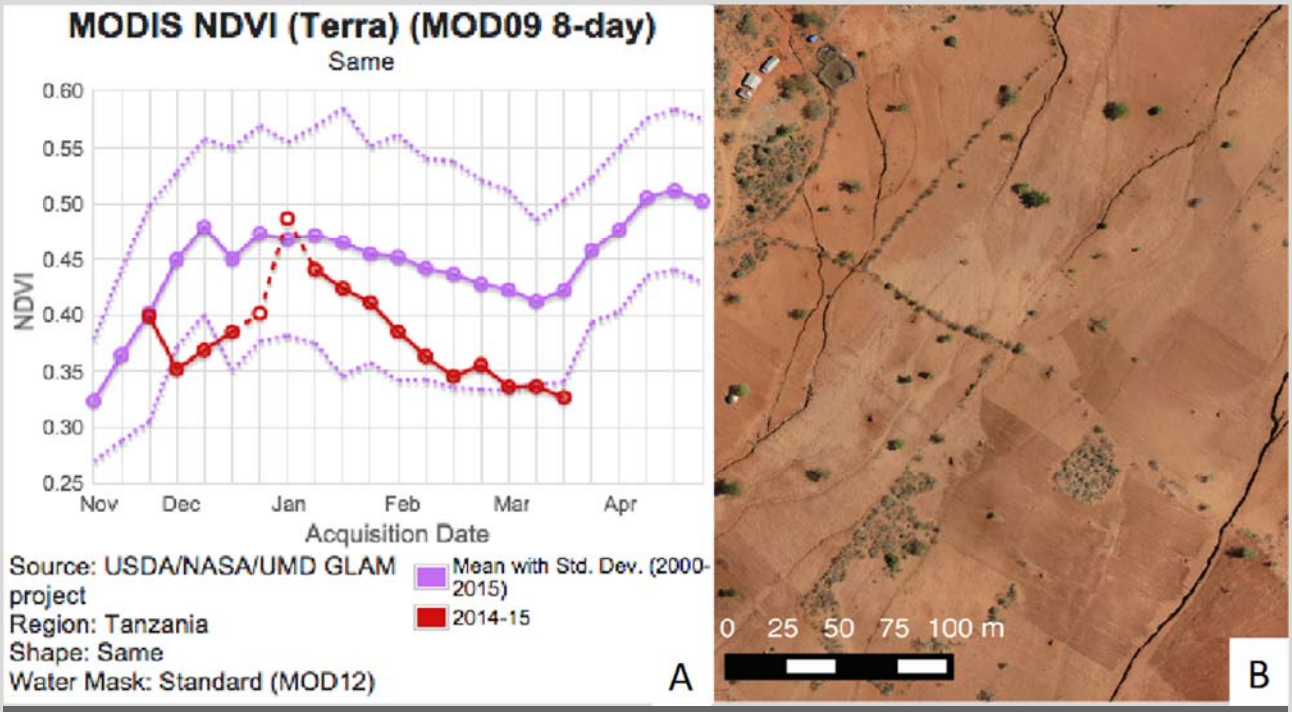


Figure A shows significantly below average NDVI during the main growing season in Same District in northern Tanzania. Figure B shows a UAV image obtained over the AgriSense study site in Same District with still bare soils three weeks into the main growing season.

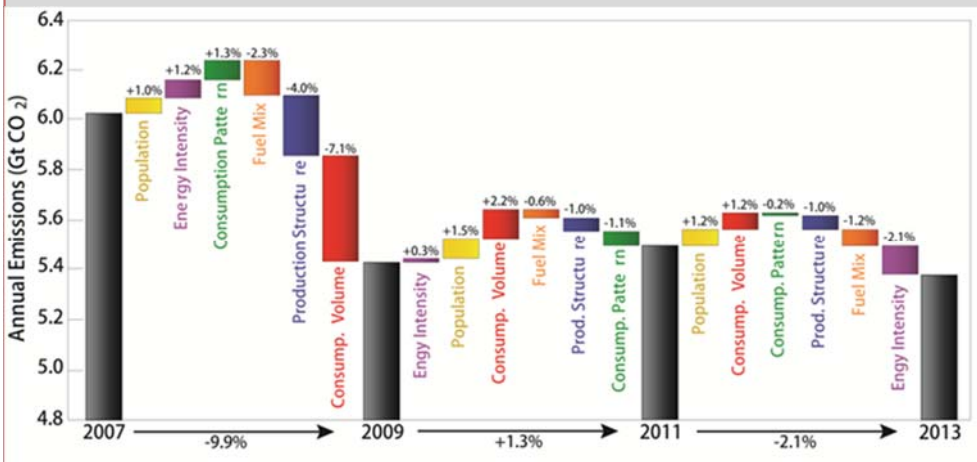
AgriSense-Africa/STARS Tracks Impact of Late Rains on Crops in Central and Northern Tanzania continued...

growing season. This critical spatially explicit information provided through GLAM-East Africa can be used free of charge and crop analysts at MAFC can use in their day-to-day monitoring. Catherine Nakalembe, a doctoral candidate, and Jan Dempewolf, Assistant Research Professor, are training food security analysts at MAFC to use this system for complimenting, validating and confirming field reports.

AgriSense-Africa is a project at the University of Maryland on agricultural monitoring for food security in East Africa, lead by Jan Dempewolf and Inbal Becker-Reshef, and funded by the Bill and Melinda Gates Foundation through an umbrella grant to the University of Twente/ITC in the Netherlands, which funds the STARS group of projects. AgriSense-Africa develops and deploys cutting-edge technologies for agricultural monitoring to the MAFC and other stakeholders. AgriSense-Africa is working closely with MAFC and with support from the implementing partner Sokoine University of Agriculture (SUA) in Morogoro on transforming agricultural monitoring for food security in Tanzania.

Drivers of U.S. Co2 Emissions between 1997 and 2013

Professors Kuishuang Feng, Laixiang Sun and Klaus Hubacek, in collaboration with Steve Davis at the University of California Irvine, analyzed the U.S. recent carbon emissions in a forthcoming publication in the journal *Nature Communications.* Fossil fuel carbon dioxide emissions in the U.S. decreased by roughly 11% between 2007 and 2013, from 6,023 to 5,377 Mt. This decline in emissions has been widely attributed to a shift from coal to natural gas in U.S. electricity production. However, the factors driving the decline have not been quantitatively evaluated; the role of natural gas in the decline therefore remains speculative. Here, the factors affecting U.S. emissions between 1997 and 2013 are analyzed. Prior to 2007, rising emissions were driven by economic growth: 71% of the increase between 1997 and 2007 was due to increases in U.S. consumption of goods and services, with the remainder of the increase due to population growth. With the global economic recession, 83% of the decrease (2007-2009) was due to decreased consumption and changes in the production structure of the U.S. economy, with just 17% related to changes in the fuel mix. During the economic recovery, 2009-2013, the decrease in U.S. emissions has been small (less than 1%) with nearly equal contributions from changes in the fuel mix, decreases in energy use per unit of GDP, changes in U.S. production structure and changes in consumption patterns. We conclude that changes in fuel mix—the primary means by which substitution of gas for coal affects emissions—have had a relatively minor role in the reduction of U.S. CO2 emissions since 2007. Energy-climate policies may therefore be necessary to lock-in the recent emissions reductions and drive further de-carbonization of the U.S. energy system as its economy recovers and grows.



Modeling climate change impacts on crop yields at site and global scales: the AgMIP project at UMD

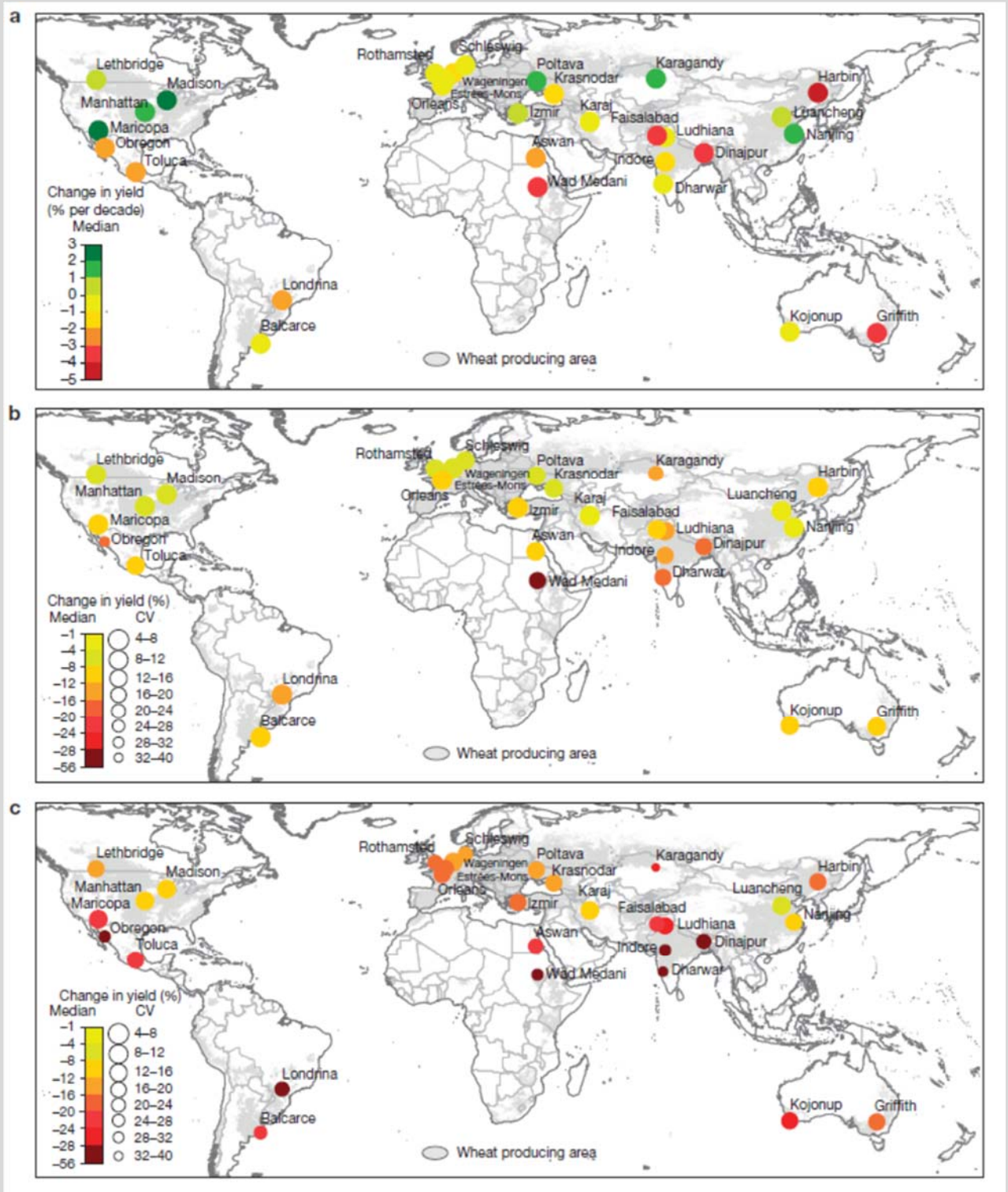
Changes in precipitation and temperature predicted as a result of climate change are likely to affect crop and livestock production worldwide. These changes will occur in a world with increasing population, expected to stabilize around 9 billion people around 2050. Thus, urgent research and technology transfer efforts are needed to develop agricultural systems adapted to the new climatic conditions in order to produce food products in the quantity and quality needed by the human population. Towards this goal, researchers César Izaurralde, Curtis Jones, and Ashwan Reddy from the Department of Geographical Sciences contribute to the Agricultural Model Intercomparison and Improvement Project (AgMIP), an international collaborative effort seeking to understand these effects using climate, agroecosystem and integrated assessment models. Here, we highlight two of these contributions: a) test and improve agroecosystem models to quantify climate change impacts on wheat and maize yields; and b) perform regional and global simulations of major crops (wheat, maize, soybean, and rice) at half degree spatial resolution under different climate scenarios. We contribute to both projects with EPIC (Environmental Policy Integrated Climate), a terrestrial ecosystem model capable of simulating the performance of many crops, management, and vegetation types to obtain information on plant yields and environmental performance (erosion, carbon balance, nutrient cycling).

In the first project, up to 30 models, including EPIC, were compared in their ability to simulate the impacts of climate on wheat and maize yields under different environmental conditions. While many models were able to acceptably mimic observed crop yields, we found that the use of an ensemble modeling approach performed best to estimate climate impacts on crop yields. In another study, the model ensemble approach was employed to predict yields of wheat plots subjected to artificial heating. Again, the model ensemble was more accurate in predicting the observed crop temperature response than that predicted by any single model. We estimated that global wheat production could fall by 6% for each Celsius degree of temperature increase (see figure).

In the second project, called Global Gridded Crop Model Intercomparison (GGCMI), over 10 agroecosystem models are being used to simulate global production of multiple crops, including maize, wheat, rice and soy, at a half-degree spatial resolution. Using common input data for weather and crop management to drive the models, simulated outputs for crop yield and other variables will be compared to provide an understanding of how models converge and diverge in their implementations of plant growth and development. [Continued on page 6]

Figure on following page: Simulated wheat grain yield change under current and higher temperatures; a) grain yield trends for 1981–2010. Grain yield trends with 2°C (b) and 2°C (c) temperature increase. Larger circles have less uncertainty in the predictions (Asseng et al. 2014).

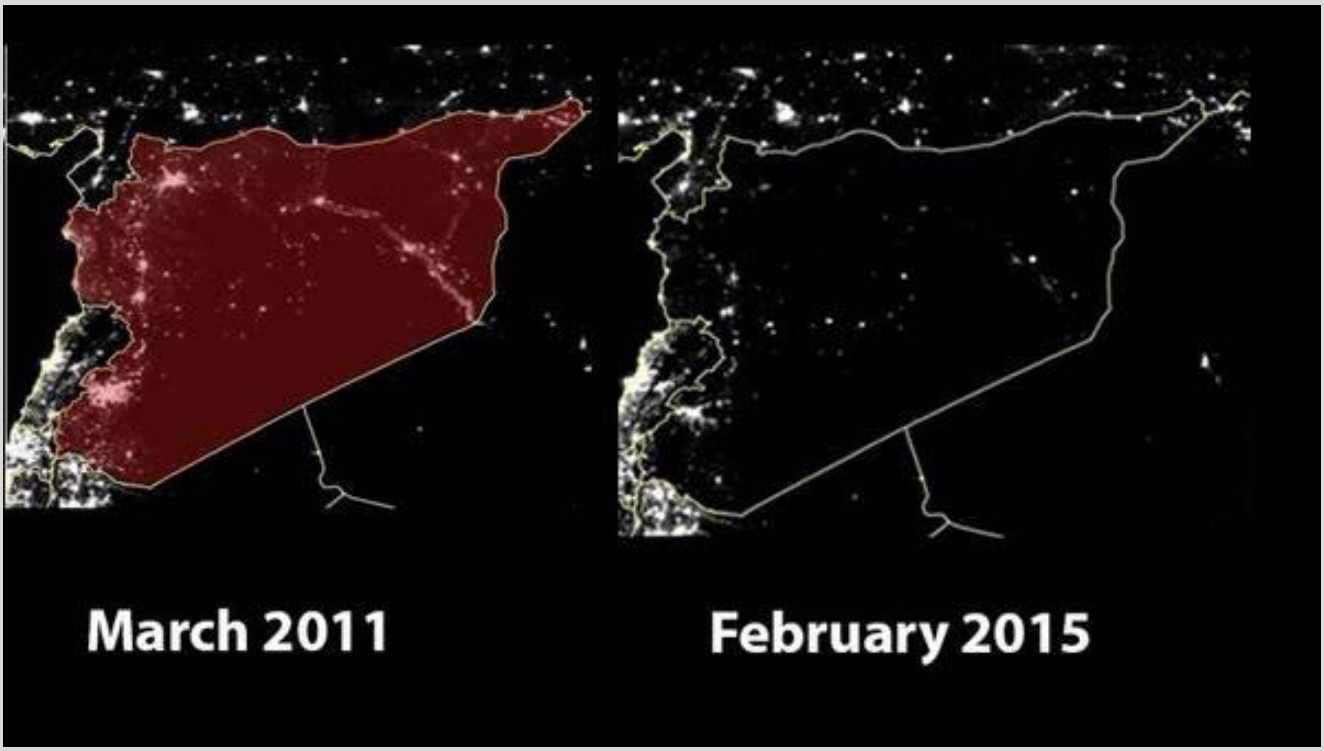
Modeling climate change impacts on crop yields at site and global scales: the AgMIP project at UMD continued...



Visiting Scientist Xi Li Sheds Light on Syrians Living in the Dark

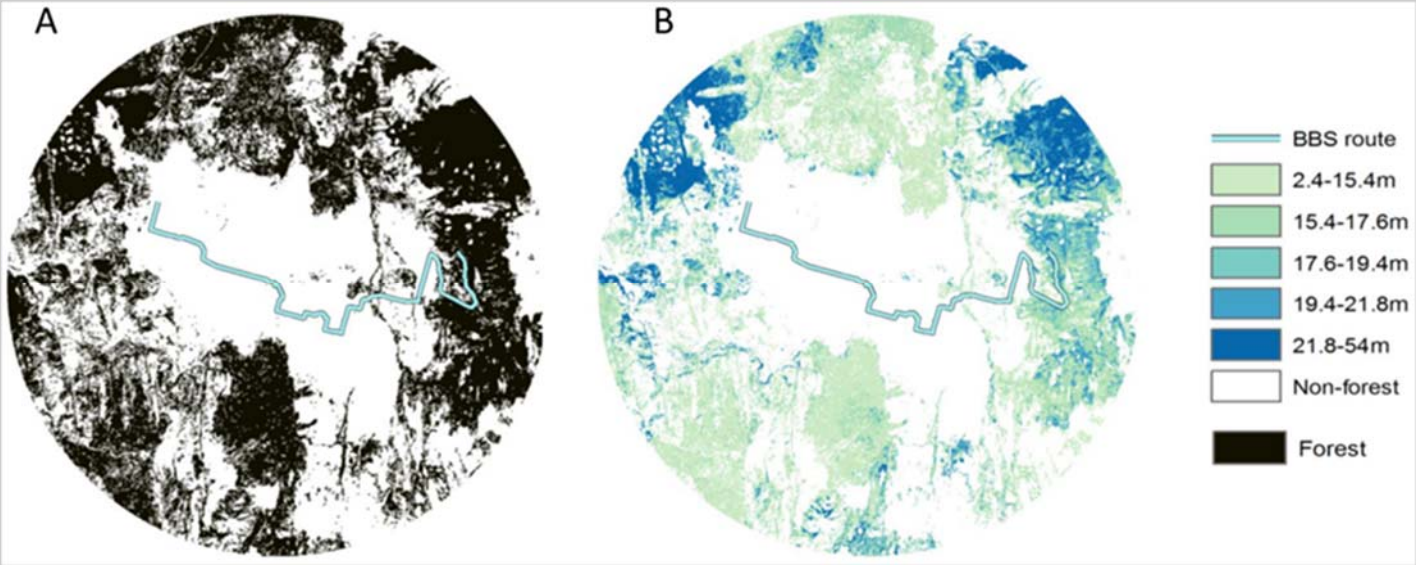
On March 11, 2015, Dr. Xi Li, a visiting scholar from Wuhan University in China, took part in a tele-briefing entitled, "WithSyria 4th Anniversary Campaign: Turn the Lights Back On." During this briefing - also attended by Madeleine Albright (former U.S. Secretary of State), David Miliband (former Secretary of State for Foreign and Commonwealth Affairs) and Dr. Majed Abu Ali (a medical doctor from Ghouta, Syria) - Dr. Li released his research results, which were cited by WithSyria (a social movement of 130 global organizations) during its launch of a global petition to end the conflict and bring the lights back on for Syria. WithSyria released a series of satellite images showing that Syria has lost 83% of its night lights over the last four years due to civil war. More than 600 media (e.g. New York Times, Washington Post, Reuters, Associate Press, CNN, BBC, etc.) and NGOs (e.g. Amnesty International, Oxfam, International Rescue Committee) have cited these images in renewing their call for attention to Syrian civilians and refugees. Moreover, the United Nations Office for the Coordination of Humanitarian Affairs is taking note - this research was included in a UN Security Council briefing on March 26th.

Dr. Li is utilizing satellite images acquired by the VIIRS (Visible Infrared Imager Radiometer Suite) instrument onboard the S-NPP satellite to study night light changes over Syria. "[This research] can be very different from media reports, because it gives the whole picture of the Syrian conflict," Dr. Li, told Voice of America. "I think I can [help] the Syrians," he said when asked about his motivation for this project.



Vegetation Height Improves Habitat Characterization and Species Richness Models

How to characterize wildlife habitat conditions and to use habitat metrics as predictive variables to model biodiversity are important questions for ecologists. The traditional ways of evaluating habitat conditions primarily rely on two-dimensional habitat structures (e.g. habitat fragmentation, patch sizes). New ways of quantifying habitat structures and modelling wildlife biodiversity are greatly needed, since the emergence of active remote sensing systems such as Light Detection and Ranging (lidar) and Radio Detection and Ranging (radar), which provide the capability to map the vertical dimension of vegetation at local and regional scales. Qiongyu Huang, a doctoral candidate with the Geographical Sciences Department, along with research assistant professor Anu Swatantran, professor Ralph Dubayah, and Woods Hole Research Center's senior scientist Scott Goetz published a paper showcasing new habitat metrics and bird richness models utilizing continental scale gridded vegetation-height data. The study shows height heterogeneity, beyond canopy height alone, supplements habitat characterization and richness models of forest bird species. The paper entitled, "The Influence of Vegetation Height Heterogeneity on Forest and Woodland Bird Species Richness across the United States," is available on the journal Plos One. This study is part of a collaborative effort between the Geographical Sciences Department and Woods Hole Research Center to investigate on Continental Scale Modeling of Bird Diversity Using Canopy Structure Metrics of Habitat Heterogeneity. Qiongyu recently received the Student Travel Award from the U.S. International Association of Landscape Ecology (IALE) to present the results of this study at IALE World Congress in Portland, Oregon, in July 2015.



Caption: A two-dimensional vegetation map (A) and a vegetation map segmented by height structure (B) are shown. The pixel-based segmentation method is used to segment two dimensional habitat maps by using height thresholds.

Intelligent Payload Module: An Airborne Demonstration of Next Generation Flight Hardware

This spring and summer Rob Sohlberg and Maureen Kelly from Department of Geographical Sciences are participating in a series of increasingly complex airborne sorties demonstrating a next generation onboard science processor designed for high data volume hyperspectral and multi-instrument missions. Sohlberg is institutional PI of the effort entitled "A High Performance, Onboard Multicore Intelligent Payload Module for Orbital and Suborbital Remote Sensing Missions" led by NASA Goddard Space Flight Center engineer Dan Mandl and the funded by NASA's Earth Science Technology Office under its Advanced Information Systems Technology program. It is the third collaboration between scientists and engineers from University of Maryland, NASA Goddard and NASA Ames Research Center with additional involvement by the US Forest Service and Universitat Politècnica de Catalunya. The effort builds off of previous SensorWeb experiments and is an effort to evaluate the hardware capabilities and software integration required to keep up with data rich sensor systems.

The IPM is an integrated solution including onboard compute and a Field Programmable Gate Array (which can do very simple tasks very quickly, much like a dedicated Digital Signal Processor circuit but at a fraction of the cost) coupled with a military speccification inertial navigation unit and a FreeWave ground communication system. The objective is to offer a system which provides a realistic high-volume, real-time data processing environment which is then used to demonstrate how earth science data products can be produced on-orbit and transmitted rapidly to the ground. Two important design goals are the integration of heterogeneous data sources and the ability to modify software post-launch. High dimensionality data is provided by an attached ChaiV-640 200+ channel hyperspectral pushbroom scanner manufactured by Brandywine Photonics.

The system was built in 2012-13, with 2014 dedicated to checkouts of the imaging, compute and comm segments. Significant unplanned time was devoted to non-trivial EMF issues where the electronic noise generated by the IPM interfered with the pilot's air band radio communication on our contract MD500 helicopter. This was not encountered during a previous test using the Ames' Autonomous Modular Sensor payload with the IPM on the USFS' Cessna Citation business jet – likely because of the greater distance separating the IPM from the aircraft antenna on the jet vs. the helicopter. This EMF issue required six months and multiple test sorties to resolve. Ultimately, protective fan screens and specially shielded connectors were employed to contain EMF bleed.

On April 13th of this year we completed a successful sortie over the Patuxent Environmental and Aquatic Research Laboratory (PEARL) where four overlapping flight lines imaged a very early green-up state with the target area including shallow coastal bay waters, lowland marsh, upland marsh, fallow no-till fields (corn), tilled fields (beans), new growth pasture, and suburban built-up with impervious surface. Geocorrected and stitched radiance from the flight lines is shown in the accompanying illustration. The IPM was in this case integrated on the spotlight mount of an MD500 utility helicopter flown under contract by Bussmann Aviation. The mission was followed on May 4th by a sortie along the same flight lines with the IPM and ChaiV-640 integrated on a fixed wing Cessna 206H out of NASA Langley. [Continued on p. 10]

Intelligent Payload Module: An Airborne Demonstration of Next Generation Flight Hardware continued...

Subsequent flights this summer will capture vegetation phenology with a stretch goal of delineating algal blooms, the latter working in conjunction with Chunlei Fan of PEARL, a facility operated by Morgan State.

The performance period is now thought the end of September under an approved NCE which will allow two more helo sorties over PEARL during mid and late summer when we can characterize changes in vegetation as well as hopefully capture active algal blooms.

The IPM is currently included on flight manifest and in the power and mass budgets for HyspIRI. The system is also being considered for cube sat and ISS delployment.

Under a new AIST award commencing in June of this year and led by Petya Campbell of UMBC, the NASA group along with Sohlberg and Jyothy Nagol from UMD will be working to implement the IPM technology on a hexacopter where will be working with Phil Townsend at University of Wisconsin to image agricultural test farms. The sensor packages for this work will include hyperspectral integrated with small footprint lidar.

In addition to advancing remote sensing and computational capabilities, these efforts are also among several blazing the way for use of small UAS platforms within the strict flight safety requirements of NASA.

Advances in Wildfire Research

Wildfires burn an average of 2.6 million hectares of land each year in the U.S. Large catastrophic wildfires have become commonplace, especially in association with extended drought and extreme weather. The demand for timely, consistent and quality fire information is high and peaks each summer when interagency fire operations and resource requests are maximized in response to multiple large wildfires.

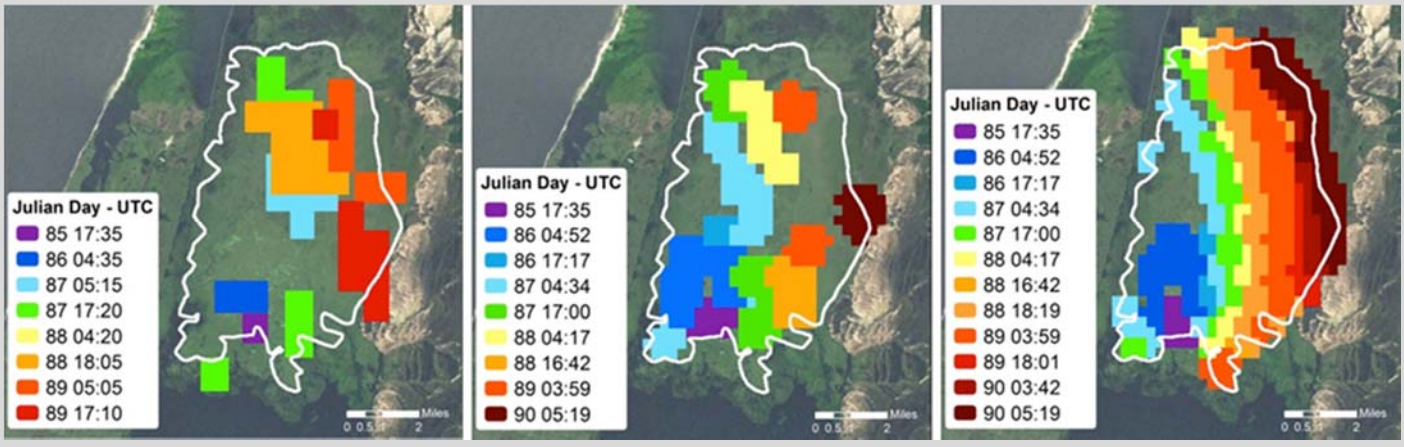
Remote sensing active fire datasets, fire modeling tools and associated geospatial products are essential to the U.S. Forest Service and interagency fire operations. They provide critical support to fire managers and help inform the public in areas threatened by wildfires. Recent advances in satellite-based fire detection and mapping, airborne fire mapping and measurement, and coupled weather-wildland fire modeling present a new opportunity to routinely map fire extent and progression, examine active fire areas in greater detail, and predict fire growth, intensification, and extreme behaviors of wildfires lasting several days.

In order to address the demand for improved fire information, Dr. Wilfrid Schroeder is leading a NASA Applied Science project that includes Dr. Patricia Oliva, fire modeling experts from the National Center for Atmospheric Research (NCAR), and remote sensing specialists from the U.S. Forest Service and the German Aerospace Center. The project's implementation is being supported by NASA, the U.S. Forest Service, and the State of Colorado totaling over $1.5 million in initial investment.

As part of this project, a new global active fire detection product was developed using 375 m data derived from the Visible Infrared Imaging Radiometer Suite (VIIRS), launched aboard the NASA/NOAA Suomi-NPP satellite in October 2011. Compared to coarser spatial resolution products, the new 375 m active fire data enable early detection of small fires and improved mapping of large wildfires. These data are used to supplement other spatially refined airborne (e.g. National Infrared Operations [NIROPS]) and space-borne (e.g. Landsat-8 and upcoming Sentinel-2) fire data sets of more limited geographic and/or temporal coverage.

[Continued on page 12]

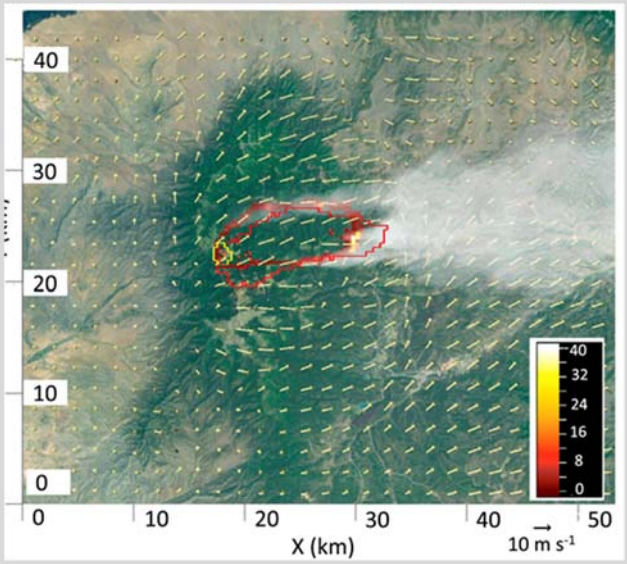
Aqua/MODIS 1 km (left) and near-coincident Suomi-NPP/VIIRS 750 m (center) and 375 m (right) mapping of wildfire progression at the Taim Ecological Reserve/Brazil during 26-31 March 2013 (Julian days 85-90). Colored polygons describe the active fire pixel footprints of MODIS and VIIRS. The white polygon outlines the fire-affected area mapped using Landsat-7 image acquired on March 31st.



Advances in Wildfire Research continued...

Complementing the new remote sensing fire data, NCAR's Coupled Atmosphere-Wildland Fire Environment (CAWFE) model combines higher resolution numerical weather prediction and wildland fire algorithms to simulate fire behavior. CAWFE has been successfully initialized and validated using the new VIIRS 375 m fire data, enabling accurate simulation of complex fire behavior during long-lasting wildfires. Compared to traditional models, this approach can now be applied to monitor and predict the growth of a fire or a group of simultaneous wildfires in a management unit from first detection until containment – a previously unattainable goal due to accumulation of model error.

The application of these refined fire remote sensing and modeling technologies improves and extends current fire mapping, monitoring, and prediction tools. Targeted decision support applications include managing wildland fires, estimating emissions of carbon, trace gases, and particulates, and anticipating air quality, watershed, and land surface impacts.



Initial VIIRS fire perimeter (yellow polygon) used for initializing fire location in CAWFE. The total heat flux (kW.m-2)(color bar) shows modeled fire extent 12h later, along with coincident VIIRS data (red polygon), modeled winds at 21 m above ground level, and modeled smoke mixing ratio (gray shade).

Department Awards 2015

The following list was announced at the pre-commencement Department Awards Ceremony on May 22:

James R. Anderson Award: **Claire Webber;** Undergraduate Research Symposium (First Place): **Kevin Denny**; Undergraduate Research Symposium Honorable Mention: **Vincent Bergamo and Colleen Shipley**; Outstanding Undergraduate Teaching Assistant: **Sean Turner;** Outstanding Teaching Assistant: **Amanda Hall and Joanne Hall;** Outstanding Teaching Assistant Honorable Mention: **Rachel Moore;** Outstanding Teaching Assistant Honorable Mention: **John Kleman;** Outstanding Masters of Professional Studies in Geospatial Information Sciences Program Student: **Thomas Gwaltney;** Excellence in Graduate Research Awards: **Dong Chen, Laura Duncanson, Qiongyu Huang, Do-Hyung Kim, Paul Montesano, Qinqing Shi, Danxia Song, Xiaopeng Song, Hao Tang, Feng Zhao, Kusuma Probhakara**; Jingli Yang Summer Graduate Fellowship: **Danxia Song**; O. E. Baker Award: **Qinqing Shi and Alexandra Tyukavina**; Outstanding Research Faculty: **Kuishuang Feng**; Outstanding Faculty Research Assistant: **Jack O'Bannon**; Graduate Student Appreciation: **Liz Smith**. Congratulations to all!

Michael Strong Accepts Award from AAG African Specialty Group

On April 26th, Geographical Sciences Ph.D. Candidate, Michael Strong, received an award for the 2015 Association of American Geographer's (AAG) Africa Specialty Group (ASG) student paper competition. The award was presented to Strong by the ASG Chair, Dr. Joseph Zume (pictured right), and acknowledged during the awards ceremony at the AAG annual meeting in Chicago. The paper, entitled, "Changing Geographies of Place Attachment in Limpopo National Park" (Mozambique), was based on Strong's first dissertation article and is currently under review at the African Geographical Review. Congratulations, Michael!

Department Administration Receive Awards

Shannon Bobbitt (pictured left with Dean Gregory Ball and Associate Dean Ann Holmes), Assistant Director of Administrative Services, received the 2015 Outstanding Staff Award bestowed by the University of Maryland College of Behavioral and Social Sciences (BSOS). The award of $1,000 was presented to Bobbitt at the BSOS Faculty Staff Recognition Reception on April 22nd. The win was a first for Bobbitt who has been with the department for 16 years.

Meanwhile, Rachel Berndtson, Assistant Director of Academic Programs, was accepted into the Chesapeake Project for the Spring 2015. Berndtson was one of 26 faculty from eight of the University's colleges who spent three days in late May learning about sustainability and finding opportunities to integrate her learnings into Department curricula. Participation in the Chesapeake Project is an important part of the BSOS College Sustainability Plan.

A hearty congratulations to both!

Department Conducts Workshop for the Government of Bangladesh

Matt Hansen and Peter Potapov were recently funded by USAID and SilvaCarbon to conduct a workshop for the government of Bangladesh to improve local capacity for satellite based land cover and land cover change classification and mapping as part of a larger collaborative project to quantify forests and forest change and equip the government to continue national scale monitoring. The workshop, held January 25 - February 13, 2015, focused on mapping Bangladesh's forest and forest loss events.

The GEOG team provided all the necessary data, programs, software and hardware for the training and classification of land cover and land cover change in Bangladesh from 2000 to 2014. Extensive spectral, spatial and temporal information is provided in 1200 metrics used to describe each pixel in the analysis. Once training data is added through visual interpretation, hierarchical, non-linear classification trees are used to identify the target class.

Potapov, LeeAnn King and Amy Hudson traveled to the national forest department headquarters in Dhaka to conduct a training for mapping land cover and land cover change with 13 government officials. Potapov held several lectures describing their methodology of land cover and land cover change classification during the first week. After which, King and Hudson continued technical and image interpretation training with the participants for the following two weeks, developing a map of the forests for 2000 and a map of forest loss events from 2000 to 2014.

The successful workshop was an exciting opportunity for all members involved. The participants were impressed with the quality of the map results, explaining that they had never seen such an accurate map of the forests in their country. The GEOG team was honored to be treated so well by their local host. Some of the participants are planning a trip to the University of Maryland this summer to continue the training and begin the accuracy assessment of the forest and forest loss event maps.

To Resettle or Not Resettle: That is the Question

Exploring Place Aspirations in Tete, Mozambique

In January 2015, Michael Strong, PhD Candidate, traveled to Mozambique's western province of Tete to conduct a pilot study for my dissertation research. His work investigates how aspirations about the future influence decisions to resettle in rapidly changing environments. Tete has had significant in-migration—as have many smaller African cities—over the past decade as individuals seek opportunities in the expanding urban area. Large deposits of coking coal (described by some to be the largest untapped seam in the world) are sited beneath the growing city. Multinational corporations from Brazil, China and India have secured concessions from the Mozambican government to extract the resources; unfortunately, this means resettling the many villages living above these deposits, and even the relocation of major infrastructure, like the international airport.

When facing resettlement, individuals often have options presented as part of the compensation package. In addition, they retain the option to protest and fight their resettlement. While this is difficult in Mozambique, where the government owns all of the land, there are many places throughout the world where researchers have observed populations who tacitly accept resettlement agendas, and even those with populations complicit in the resettlement process. Why, as Robert Fletcher asked in a seminal piece from 2001, would individuals support their own displacement and accept the widely reported negative outcomes that accompany resettlement? Strong believes, as does Holly High and others, that individuals see resettlement as an opportunity for a better future. Calling on the power of hope—because anything has to be better than what they currently have—these individuals believe they will have a better [Continued on page 16]

To Resettle or Not Resettle: That is the Question

Exploring Place Aspirations in Tete, Mozambique continued...

life if they resettle. Strong's work contributes by analyzing how these beliefs about future environments influence this decision. He asks: (1) Who are these people making a decision to resettle? What distinguishes them from those who resist? (2) How do they make a decision to resettle, and specifically, how and at what point in the process do these aspirations influence the decision? (3) What is the role of the environment in prompting decisions to resettle? This pilot study focused on testing Strong's study instruments, but he will return to Tete this summer to collect the data he needs to answer these questions. Stay tuned!

Photo on previous page:

Residents from the four resettled villages were relocated based upon their livelihood at the time of resettlement. Individuals with a subsistence farming livelihood were resettled to Cateme, a village constructed by the mining company nearly 40 km east of the original villages. Strong toured this village to gain a sense for the differences in the post-resettlement sites and snapped this picture of two children playing in the only working public water fountain. Given the remoteness and poverty of this village, vehicles (and white people) are uncommon; the children were just as interested in him as he was in them.

Photo below:

A baobab tree in a neighborhood adjacent to the study site refuses to give up in the struggle to survive. Baobab is a common name for several tree species indigenous to Africa. Resettled populations regularly struggle post-resettlement; yet, there is nearly always a hope that life will get better. The baobab is a fitting metaphor for its neighbors in that the residents of the resettled village, 25 de Setembro, have a spirit rarely seen in westerners.

Photo below:

Strong visited during the brief rainy season. Intense downpours occurred with little notice, forcing the research team to take shelter in a variety of random places that afforded the opportunity to talk with additional respondents. Here, the team (clockwise from bottom left: Z. Macamo, M. Strong, C. Meque) listen to the story of a local store owner offering shelter.

Students Prepare for a Field Campaign as part of Tri State Forest Carbon Monitoring System Project

This summer a team of 8 undergraduates, led by Ph.D. students Katelyn Dolan and Rachel Moore Marks, will spend over 2 weeks measuring trees in the diverse landscapes of northern Pennsylvania. The information they collect will be used to validate high-resolution wall-to-wall maps of forest carbon stocks, created with airborne lidar, satellite imagery and field data collected by the U.S. Forest Service's Forest Inventory and Analysis (FIA) program.

Local, national and international programs have an increasing need for precise and accurate estimates of forest carbon and structure to support greenhouse gas reduction plans, climate initiatives and other international climate treaty frameworks such as REDD+. Central to these activities is the need for efficient MRV (measurement, reporting and verification) systems that provide an accounting of forest carbon emission and sequestration at different scales and spatial resolutions with appropriate temporal frequencies. NASA recognized the urgent need for the development of these MRV systems and initiated the Carbon Monitoring System (CMS) program. The Global Ecology Lab (GEL), led by Professors Ralph Dubayah and George Hurtt, working with NASA, the University of Vermont, the U.S. Forest Service and commercial entities, developed a comprehensive framework for estimating county and statewide high-resolution carbon stocks across the state of Maryland. Using a prognostic ecosystem model, carbon fluxes and carbon sequestration potential were predicted at an unprecedented spatial resolution (1 ha) over the entire state. The project demonstrated the feasibility of large-scale forest carbon mapping using airborne lidar.

GEL is now in the first year of expanding the high resolution mapping of carbon stocks, dynamics and future sequestration potential to the 3-state region of Pennsylvania, Delaware and Maryland, a more than 5 fold increase in mapped area, which is a critical step in the development of a national CMS that will meet local, regional and national stakeholder needs. The Northern Mixed forests region of Pennsylvania was chosen for this summer's intensive field validation campaign as it represents a large ecological region (i.e. unique climate, topography, soils and species) not represented in previous CMS Maryland projects. Working in teams, students will use maps and GPS (global positioning systems) to locate more than 200 random stratified plots taking measurements that relate to above ground forest biomass at each plot such as species, basal area and max height.

Providing undergraduates the experience to participate in a large project like this is critical to both their development and the training of the next generation of field practitioners, researchers, policy makers and informed citizens.

During a training session to familiarize the summer crew with field protocols and instruments, students shared what drew them to this project and summer fieldwork:

Kevin, a junior Geographical Sciences major is one of 3 field crew members who took Dr. Hurtt's GEOG442 Biogeography and Environmental Change course. "In the class we talked about the missing carbon sink and forests' role in the carbon cycle – it was fascinating. I was really excited to hear about the opportunity to be part of a project that might help solve part of the puzzle."

Chris Woodring, a GIS & Remote Sensing major, recently transferred into the department from Montgomery College, where he received his associate's in Applied Geography and certificates [Continued on p. 18]

Students Prepare for a Field Campaign as part of Tri State Forest Carbon Monitoring System Project continued...

in GIS and Geographic Education after a long career in the U.S. Marines and Navy. “I am excited to finally take concepts learned in the classroom and apply them, hands on, in the real world.”

Griffin Rickle is joining the field crew from across campus as a Math major, Computer Science minor and member of Terrapin Trails. “I love science and being outdoors. I was drawn to this project because of its emphasis on learning more about the world around us and its potential to help find solutions to major problems the planet faces, such as climate change, and of course the opportunity to be outside.”

The opportunity to be outdoors, and have hands-on experience beyond the classroom was echoed repeatedly by students. This is the first year of the 3 year project, and the team is looking forward to engaging students and keeping them involved in the future.

Picture from left to right: John Pellegrino, Umar Ahmad, Kevin Friant, Griffin Rickel, Chris Woodring, Alex Driessen and Rachel Moore (Geographical Sciences Ph.D. student and field crew manager). Not pictured: Field crew members Joe Duckworth and Eric Woolery.

AgriSense-Africa STARS' GeoODK Pilot Project Off to a Super Start

The University of Maryland (UMD) and Sokoine University of Agriculture (SUA) are building agriculture-monitoring capacity in Tanzania at the local and national level of government through electronic field data collection. This initiative is part of the AgriSense-Africa STARS (Spurring a Transformation for Agriculture through Remote Sensing) project. In January and March 2015, UMD in collaboration with the Ministry of Agriculture, Food and Cooperatives (MAFC) and SUA introduced the GeoODK Android Application at training workshops in the Morogoro Region. GeoODK was developed at UMD and is based on Google's Open Data Kit (ODK). This smartphone app allows the efficient collection of field data in electronic format using a smartphone or tablet, and direct and wireless submission to an online database. Among the workshop participants were representatives of the National Food Security Department at MAFC, agricultural advisors and officers from the regional and district offices respectively, and agricultural extension officers from within the Morogoro region.

During the workshops, paper forms currently used by MAFC were converted to electronic forms. With input from workshop participants the forms were revised and improved to meet both MAFC's mandate to monitor agriculture for food security and to streamline data collection at the village and district level. Improvements included adding the invaluable option to take and submit digital photographs of crop pests and diseases. Form design was followed by hands-on exercises (Figure 1) on completing and submitting them online. The GeoODK system significantly increases the efficiency of data collection by streamlining data entry through menus and options, reducing delivery time to just minutes from source to analyst, and eases access and analysis through the online database. The data are instantaneously accessible to any authorized entity within the government and can be used to integrate with other data sources and satellite remote sensing information. The participants welcomed the new technology with much enthusiasm and were equipped with an Android tablet each to participate in the GeoODK pilot project with the aim to facilitate MAFC's mandate.

[continued on p. 20]

Photo: Extension agents learning how to collect field data using GeoODK electronic forms.

AgriSense-Africa STARS' GeoODK Pilot Project Off to a Super Start continued...

Extension officers from pilot wards and agricultural officers from all districts in the Morogoro region began making weekly submissions of data to the online database after the workshop was complete. Progression of crop development and condition, and occurrences of crop pests and diseases have been reported.

Example images submitted by ward Extension Officers: [top left] rice viral disease in Ulanga District, Mawasiliano ward; [bottom left and top center] aphids and stalk bore affecting maize; [top left] cigar end rot affecting bananas in Gario district, Ngowe ward; [bottom center] beetles affecting vegetables in Morogoro district and [bottom right] rodent infestation in Mvomero District, Kanga Ward.

Spring 2015 Commencement Photos

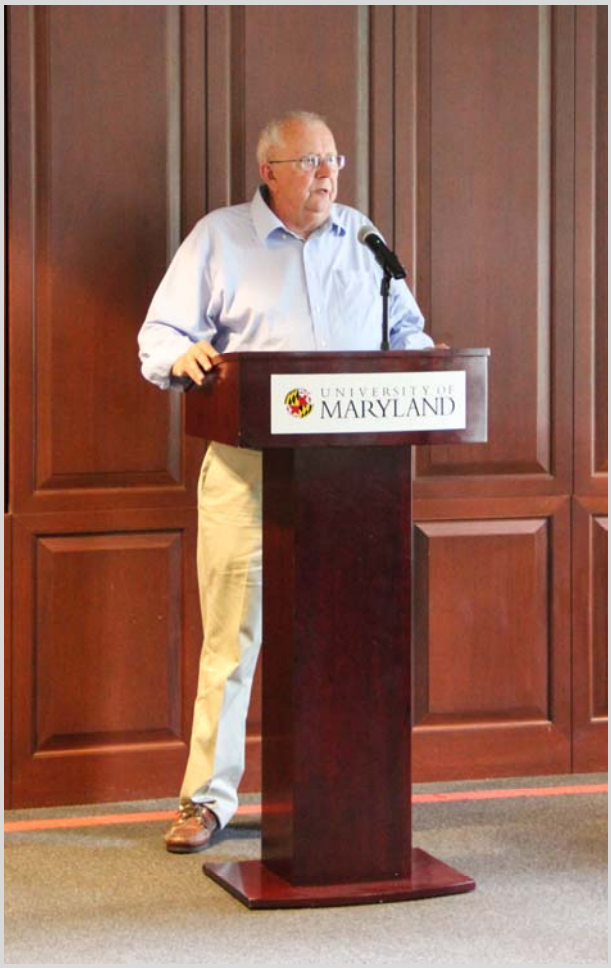
Spring 2015 Commencement Photos continued...

GEOG Honors the 2015 Lunar New Year

On February 19th, the Department hosted its second Lunar New Year Event, which was organized by Chinese graduate students. More than seventy students, staff and faculty members were in attendance to kick off the exciting 2015 lunar year. Chris Justice, the Department Chair, opened the event with a warm and humorous welcome. PhD student Qinqing Shi gave a presentation on traditional and modern customs of the lunar new year celebration in China. An impressive, traditional Chinese dance was performed by research associate Huiran Jin, visiting student Hongya Zhang and PhD student Feng Zhao as a lunar new year gift to everyone. In addition, there was an exciting martial arts performance from Daniel Liang and Brian Tran, members of the UMD martial arts club, which was a great enjoyment for everyone. After the performance, tasty and popular Chinese cuisine including dumplings and spring rolls were served to all attendants. While enjoying the food, faculty and students played games such as the "advanced group chopsticks challenge" and "draw and guess." Puzzles were distributed around the room, giving people the opportunity to relax their minds from work and research. Meanwhile, tea-tasting and origami-making were offered by PhD students Danxia Song and Qinqing Shi. Everyone enjoyed the tasty food, prize winning games and cultural exploration. The event once again provided an excellent opportunity for the department to gather together and give thanks after another year of hard work, and to also set a promising start to 2015.

GEOG Bids Farewell to Sam Goward and John Townshend

On May 5th, the Department honored Samuel Goward and John Townshend who retired this semester. Both Professors are former Chairs and career Geographers. Goward came to Maryland in 1986 as an Assistant Professor, Townshend joined the Department as Chair three years later and in 2009, became Dean of the College of Behavioral and Social Sciences. Together, they transformed GEOG by right-sizing the teaching program, creating the MPS/GIS program and emplacing mechanisms to ensure the Department runs efficiently and continues to grow. Both men made significant scientific contributions to satellite remote sensing, and as a result, both received the William T. Pecora Award granted by USGS and NASA. Goward ensured development of the national Landsat Program, whilst Townshend introduced China to the benefits of data-sharing, becoming an Honorary Professor at three Chinese institutions. Recently, Goward was named Professor Emeritus and Townshend will join the research faculty as a Research Professor. We thank these two outstanding people for their commitment and wish them well in their retirement.



GEOG Participates in Maryland Day 2015

On Saturday, April 25th, the University of Maryland held its 17th Annual Maryland Day celebration, which offers the public and prospective students the opportunity to learn more about UMD academic programs as well as the admission's process, financial aid and scholarships, student services, etc. The Department of Geographical Sciences hosted a booth on the campus mall as well as interactive presentations in McKeldin Library. Wilfrid Schroeder (Research Associate Professor) and Jyoteshwar Nagol (Research Assistant Professor) showcased an unmanned aerial vehicle (UAV), popularly referred to as a "drone." They discussed UAV technology and it's use in "next gen" remote sensing efforts (e.g. data collection in Tanzania). Kelley O'Neal (McKeldin Library GIS Specialist) presented several Google Earth tours, including a tour of the moon and lunar landing sites. Matt Hansen (Professor, pictured below), utilizing the Global Forest Watch website, explained the causes of forest destruction (e.g. conflict, forest fires, tornadoes, forest clearing for farming purposes) in various parts of the world and shared candid stories of his travels across Africa, which brought life, understanding and empathy to the map display. As this year was such a success, the Department will participate in the event again in 2016. To offer display ideas or volunteer, please contact Ron Luna or Katie Doyle.

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