

## BIOSPHERIC SCIENCES BRANCH HIGHLIGHTS

July – August 2008

- SCIENCE POLICY AND TEAM MEETINGS, WORKSHOPS

- \*\* **Ross Nelson attends airborne/space LiDAR meeting**

Ross Nelson (Code 614.4) traveled to Egilsstadir in eastern Iceland August 14-20 to attend a small workshop with Norwegian, Swedish, and US co-investigators. The participants included Göran Ståhl and Mats Nilsson - Swedish University of the Agricultural Sciences, Erik Naesset, Terje Gobakken, Liviu Une, and Ole Martin Bollandsas - Norwegian University of the Life Sciences, Tim Gregoire - Yale University, and Jim Flewelling – private forest consultant. This group meets once or twice a year to discuss statistical and operational issues concerning the use of airborne and space LiDARs as sampling tools for large area (e.g., county, state, province, subcontinent) surveys of forest resources. Two topics were discussed at this particular meeting: (1) variance estimators that may be employed when airborne laser scanners are used to systematically sample regions, and (2) the development of analysis procedures and an appropriate statistical framework for robust change detection estimates using profiling and scanning airborne LiDARs and GLAS. The 4-day meeting was very productive, and the information exchange will allow Nelson to complete a study in Hedmark County, Norway, the results of which are due to the Norwegian Research Council in 2009. The next meeting may be held at Yale in February or March of 2009.

- \*\* **Carbon Cycle and Ecosystems Office hosts Science Steering Group meeting**

The Carbon Cycle and Ecosystems Office and the NACP Coordinator, Dr. Peter Griffith (SSAI/614.4) hosted a meeting of the Science Steering Group of the North American Carbon Program (NACP), a core element of the US Climate Change Science Program. The meeting was attended by leading carbon cycle scientists and the federal agency program managers from the Carbon Cycle Interagency Working Group (NASA Terrestrial Ecology, NASA Ocean Color and Biogeochemistry, USDA Forest Service, USDA CSREES, DOE, NSF, and NOAA).

- \*\* **Molly Brown presents to Ed Weiler and Franco Einaudo**

Molly Brown (Code 614.4/SSAI) presented the results of her recent work to Ed Weiler and Franco Einaudi for July's 'science chat' on July 25<sup>th</sup>. The presentation was entitled "Climate Change and Food Security: The Role of Earth Science Models and Observations". She gave an overview of the food security problem in Africa which entails the interrelationship between population increases, stagnant agricultural productivity, lack of investment, trade imbalance and climate change. The talk described recent funded research that integrates NASA data and models into USAID's Famine Early Warning Systems Network.

- FUNDED RESEARCH

**\*\* Code 614.4 Scientists Travel to Northern Siberia for Science Expedition**

From July 10-25, 2008, Dr. Jon Ranson led an international team of scientists on a three-week scientific expedition to study an extremely remote section of northernmost central Siberia. Branch members participating included Ross Nelson, Guoqing Sun, and Paul Montesano. The expedition was a collaboration with Dr. V.I. Kharuk and three scientists from the Sukachev Institute of Forests, Russia. This year the scientists traveled above the Arctic Circle along the Kotuykan and Kotuy Rivers. The goals of the study were to obtain field measurements of larch forests useful for carbon cycle and ecosystem dynamics studies. The expedition to Siberia is featured and on the Earth Observatory web site:  
<http://earthobservatory.nasa.gov/Study/SiberiaBlog2008/page1.html>.

**\*\* Molly Brown co-author of article in the National Academy of Sciences Proceedings**

The article recently published:

Funk CC, Dettinger MD, Michaelsen JC, Verdin JP, Brown ME, Barlow M and Hoell A (2008). The Warm Ocean Dry Africa Dipole Threatens Food Insecure Africa, but Could Be Mitigated by Agricultural Development. Proceedings of the National Academy of Sciences. PNAS has scheduled publication of the article in it's online Early Edition (EE) and posted it on August 5: <http://www.pnas.org/content/early/2008/08/05/0708196105.full.pdf+html>

NASA also had a feature on the article:

A new study, co-funded by NASA, has identified a link between a warming Indian Ocean and less rainfall in eastern and southern Africa. Computer models and observations show a decline in rainfall, with implications for the region's food security.

Rainfall in eastern Africa during the rainy season, which runs from March through May, has declined about 15 percent since the 1980s, according to records from ground stations and satellites. Statistical analyses show that this decline is due to irregularities in the transport of moisture between the ocean and land, brought about by rising Indian Ocean temperatures, according to research published today in Proceedings of the National Academy of Sciences. This interdisciplinary study was organized to support U.S. Agency for International Development's Famine Early Warning Systems Network.

Full text and images:

[http://www.nasa.gov/centers/goddard/news/topstory/2008/indianoceanwarm\\_release.html](http://www.nasa.gov/centers/goddard/news/topstory/2008/indianoceanwarm_release.html)

**\*\* Lyapustin paper published in Geophysical Research**

"An automatic cloud mask algorithm based on time series of MODIS measurements", was recently published in the Journal of Geophysical Research. The complete citation is:

Lyapustin, A., Y. Wang, and R. Frey (2008), An automatic cloud mask algorithm based on time series of MODIS measurements, J. Geophys. Res., 113, D 16207, doi:10.1029/2007JD009641.

**\*\* UMD/GSFC Applications Proposal Receives Letter of Support from MD Gov. O'Malley**

A recent UMD/GSFC collaborative proposal submitted to the "Decision Support Through Earth Science Research Results" call for ROSES 08 received a letter of support from the Governor of Maryland, Martin O'Malley. The proposal is entitled "Enhancing the Implementation of Winter Cover Crops in the Chesapeake Bay Watershed Using NASA Satellite Data" and aims to use Landsat and MODIS satellite information to produce annual croplands information/data on croplands across the Chesapeake Bay Watershed (CBW), including the detection of winter cover crops. These data are expected to feed a Decision Support System within the Chesapeake Bay Program and the State of Maryland that will assist in prioritizing high risk areas for winter cover crops planting. Winter cover crops are recognized as one of the best management practices that can substantially reduce the runoff of nitrogen and other nutrients into the Bay. The Principal Investigator of the proposal is Andrew Elmore (UMD/Center for Environmental Science). Co-Is from GSFC are Eric Brown de Colstoun (Code 614.4/UMBC/GEST) and Michael Van Steenberg (Code 604.0). Collaborators from GSFC are Jim Irons (Code 613.0) and Jeff Masek (Code 614.4). The proposal also includes Co-Is from NOAA and USDA-BARC.

\*\* Branch conducts Hyperspectral field research at USDA

In collaboration with Dr. Bill Kustas, Head of the USDA/BARC Hydrology and Remote Sensing Laboratory, the Branch's Spectral Bio-Indicator team (Betsy Middleton, PI, Code 614.4) has been conducting hyperspectral field research in the nearby USDA cornfield, in conjunction with a continuously operating eddy covariance flux tower. The relationships of select hyperspectral indices to crop-level carbon uptake dynamics are being investigated. Of special interest are the Photochemical Reflectance Index (PRI) and several other narrow band spectral indices related to chlorophyll fluorescence. The field experiment leader is Fred Huemmrich (JCET). Thus far, we have collected full diurnal data sets during one day of each week over the past month, with collections to continue for another month; each field day is followed by a day of laboratory work for leaf biophysical properties. Field data collections were made along fixed 100 m transects for: hyperspectral nadir reflectance obtained hourly with an ASD spectroradiometer, and multiple times throughout the day with an Ocean Optics spectroradiometer; off-nadir hyperspectral reflectance with an ASD at selected times; leaf level photosynthesis and chlorophyll fluorescence with portable Li-Cor chambers (one at ambient CO<sub>2</sub> and one at elevated CO<sub>2</sub>); leaf level *in situ* hyperspectral reflectance with an ASD and probe; leaf hyperspectral optical properties using an ASD and integrating sphere; and various supporting measurements such as incoming radiation, APAR, LAI, and soil moisture and reflectance. This data set provides all the parameters needed for canopy radiative transfer models. The team includes Betsy Middleton, Fred Huemmrich, Petya Campbell, Ben Cheng, Qing Zhang, and Larry Corp (with assistance from several others).

\*\* Branch Members attend IGARS meeting

Marc Imhoff, Betsy Middleton, Jack Xiong, Petya Campbell, Fred Huemmrich, Larry Corp, and Ben Cheng attended the IGARS conference in Boston, Massachusetts, July 6-11.

Marc reviewed selected papers, and acted as session Chair for 2 sessions in the BioGeosciences: Change Detection in Land Use/Land Cover Sessions I (oral) and II (poster).

Betsy presented an oral paper on Vegetation Biophysical Parameter Estimation, entitled “Relating a Spectral Index from MODIS and Tower-Based Measurements to Ecosystem Light Use Efficiency for a FluxNet-Canada Coniferous Forest” (Paper ID: 1961; Middleton, Cheng, Hilker, Huemmrich, Black, Krishnan, and Coops). She was a co-author with the Spectral Bio-Indicator team (Code 614.4, Fred Huemmrich, Petya Campbell, Larry Corp, and Ben Cheng) on a second oral paper (Huemmrich et al., “Using Reflectance Measurements to Determine Light Use Efficiency in Corn”) and on 3 poster papers (Campbell et al., Corp et al., and Cheng et al.).

Jack presented 2 papers (posters) on MODIS calibration issues:

- (1) Comparison of Terra and Aqua MODIS VIS Bands On-orbit Response
- (2) On-orbit Noise Characterization for MODIS Reflective Solar Bands

\*\* Xiong and Butler chair and present at SPIE conference

Jim and Jack attended the SPIE conference on Earth Observing Systems at San Diego, CA (10-14 August, 2008) and also served as session chairs. Jack chaired a session on Calibration and Jim chaired sessions on MODIS I, MODIS II GEOSS, and an EOS Joint Session I.

Jack also presented 2 papers:

- (1) Characterization of MODIS VIS/NIR Spectral Band Detector-to-Detector Difference
- (2) Assessment of MODIS Scan Mirror Reflectance Changes On-orbit

\*\* Butler and Xiong chair and present at CALCON meeting

Jim Butler and Jack Xiong attended the CALCON at Logan, UT (24-28 August, 2008). Jim served as session chair for Pre-launch Testing and Post-launch Performance, Session A and B. and Jack gave 2 presentations:

- (1) MODIS On-board Blackbody Performance
- (2) MODIS Solar Diffuser On-orbit Performance

#### • SIGNIFICANT ACTIVITIES

\*\* Integrated Geospatial Education and Technology Training (iGETT)

Landsat E/PO staffers Jeannie Allen and Laura Rocchio, both Code 614.4/SSAI, with the assistance of Richard Irish and Eric Brown de Colstoun, also both Code 614.4/SSAI, and other partners on the “Integrated Geospatial Education and Technology Training (iGETT)” project, gave two Summer Institutes on remote sensing data analysis and applications for two groups of community college faculty from all over the country, June 14-27, at Del Mar College in Corpus Christi, TX.

The first group of participants was returning after a two-week Institute in 2007 for one week of learning about program development: grant writing, articulation with high schools and four-year institutions, student recruitment, and more. The second group of participants learned what the first group had learned in 2007: remote sensing basics, how to use ENVI professional image processing software, how to use a spectrometer and a handheld GPS, how

to download federal remote sensing data (namely Landsat, MODIS, and ASTER), about remote sensing applications, and about field validation techniques. The two groups' Institutes overlapped so they could learn from each other and build their geospatial education community. The first group presented drafts of Learning Units they had developed for this project over the previous year, as well as Marketing Plans for the coming year; and the second group submitted Learning Unit proposals. All Institute training resources and participant Learning Units will be publicly available.

iGETT is funded by the National Science Foundation's Advanced Technological Education Program (NSF DUE-0703185).

\*\* Elissa Levine attends special opening ceremony of new exhibit on soils at Smithsonian

Dr. Elissa Levine attended a special opening ceremony of a new exhibit on Soils at the Smithsonian Natural History museum as part of it's "Forces of Change" series. The exhibit, "Dig It: The Secrets of Soil", is a 5000 square foot interactive exhibition that reveals the complex world of soil and how this hidden ecosystem supports almost every form of life on Earth.

Dr. Levine contributed as a member of the design committee that has been actively working on preparing the exhibit since 2000. Visitors can find the Soil exhibition on the second floor of the Natural History Museum between the Hope Diamond and the exit to the IMAX Theater. It will be available for viewing until December 2010 at which time the exhibit will travel to other museums across the county.

\*\* "Interoperable Sensor Architecture for Sensor Webs in Pursuit of GEOSS" team selected for Innovative Technologies award

Steve Ungar and Lawrence Ong, of the Biospheric Sciences Branch (614.4) EO-1 Mission Science Office (MSO), are members of the ESTO/AIST-funded "Interoperable Sensor Architecture for Sensor Webs in Pursuit of GEOSS" team of 15 researchers led by Dan Mandl (Code 581). This team was selected by R&D Magazine for their annual award for the top 100 innovative technologies of 2008 for their work on Sensor Web 2.0.

The ceremony for this award has been dubbed as the "Oscars of Invention" by the Chicago Tribune. Each year, R&D Magazine selects 100 of the most innovative technologies that have the potential to further scientific discovery and greatly affect human life and the way we live from an international pool of contestants from universities, private corporations, and government labs.

Goddard's Sensor Web 2.0 has already shown its capability in a recent wildfire management campaign in California. The principal contribution made by Drs. Ungar and Ong to this activity was rapid development of fire visualization products from algorithms constructed to exploit EO-1 ALI and Hyperion fire detection and assessment capabilities.

**\*\* Bounoua mentors 2 summer students**

Lahourari Bounoua was mentor for 2 summer students, one from the High School Intern Program sponsored by the GSFC Education Office (Bonnie McClain) and the second student was an international graduate student from Algeria supported by the University of Science and Technology of Oran-USTO. Lahourari also participated in the E-Mentoring Network for Diversity in Engineering and Science.