

Biospheric Sciences Branch Highlights
Code 614.4
November - December 2006

- **SCIENCE POLICY AND TEAM MEETINGS, WORKSHOPS**

**** Masek (614.4) participates in first meeting of the NASA Carbon Cycle and Ecosystems Management Operations Working Group**

Jeff Masek (614.4) participated in the first meeting of the NASA Carbon Cycle and Ecosystems Management Operations Working Group (MOWG) in Silver Spring Maryland, Nov 6-7. The CC&E MOWG is charged with assembling a science research plan for the CC&E focus area for the next ~10 years, including prioritization of science questions, and providing feedback on the NRC Decadal Survey. The team was assembled by Diane Wickland (HQ CC&E Focus Area lead) and is chaired by Jon Foley (U. Wisconsin) and Michael Behrenfeld (OSU).

**** Middleton (614.4) participates in European Space Agency (ESA) sponsored Mission Assessment Group meeting**

Dr. Betsy Middleton participated in a European Space Agency (ESA) sponsored Mission Assessment Group meeting for a pre-Phase A Concept study of a potential future satellite mission, the Fluorescence Explorer (FLEX). This mission addresses the measurement of chlorophyll fluorescence for photosynthetic efficiency determinations of terrestrial ecosystems globally. Dr. Middleton was an invited Outside Observer. This initial meeting was held on Nov. 20-21, 2006 at ESTEC in Noordwijk, The Netherlands. A second meeting is scheduled for Feb. 12-13 at ESTEC. ESTEC is the Land Surfaces Unit of the Mission Science Division for ESA.

**** Lahouari Bounoua (Code 614.4) attends workshop on "Climate Variability and its Impacts in the Mediterranean Area".**

The workshop was organized jointly by NATO, the CNRS and the University of Agadir in Marrakech (Morocco) between the 24 and 27 November 2006. Dr Bounoua's talk emphasized the role of vegetation and its interactions with climate and the carbon cycle and how it can possibly attenuate the greenhouse effect to due atmospheric CO₂ increase. He also highlighted NASA's satellite products providing local, regional and global coverage. Several ideas for collaboration were formulated by local universities and institutions.

- **FUNDED RESEARCH**

- ** Biospheric Sciences Branch members contribute to five papers**

Five papers related to the International Satellite Land Surface Climatology Project (ISLSCP) Initiative II Data Collection are now in press for a special issue of the Journal of Geophysical Research-Atmospheres.

Bounoua, L., J. Masek, and Y. M. Tourre (2006), Sensitivity of surface climate to land surface parameters: A case study using the simple biosphere model SiB2, *J. Copy. Res.*, 111, D22S09, doi:10.1029/2006JD007309.

Imhoff, M.L. and Bounoua, L. (2006), Exploring Global Patterns of NPP Carbon Supply and Demand, *JGR special section ISLSCP II*.

Brown de Colstoun, E. C., R. S. DeFries, and J. R. G. Townshend (2006), Evaluation of ISLSCP Initiative II satellite-based land cover data sets and assessment of progress in land cover data for global modeling, *J. Geophys. Res.*, doi:10.1029/2006JD007453, in press.

Hall, F. G., E. Brown de Colstoun, G. J. Collatz, D. Landis, P. Dirmeyer, A. Betts, G. Huffman, L. Bounoua, and B. Meeson (2006), ISLSCP Initiative II global data sets: Surface boundary conditions and atmospheric forcings for land-atmosphere studies, *J. Geophys. Res.*, doi:10.1029/2006JD007366, in press.

Hall, F. G., J. Masek, and J. G. Collatz (2006), Evaluation of ISLSCP Initiative II FASIR and GIMMS NDVI products and implications for carbon cycle science, *J. Geophys. Res.*, doi:10.1029/2006JD007348, in press.

- ** Lyapustin and Wang develop new generic algorithm from MODIS**

Dr. Lyapustin and Dr. Wang (Code 614.4) developed a new generic algorithm for simultaneous retrievals of atmospheric aerosols and surface bidirectional reflectance/albedo from MODIS. The new method uses the history of previous measurements and an image-based rather than pixel-based processing concept. The algorithm works successfully over both dark and bright land surfaces with the current exception of snow-covered areas. An initial comparison with AERONET measurements over continental USA, polluted urban centers, deserts etc. shows a high quality of retrievals. Work is underway to prepare the processing code for an operational application.

- ** Jack Xiong (Code 614.4) contributes to peer reviewed book chapters**

Xiong X., Isaacman A., and Barnes W.L., *MODIS Level-1B Products*, *Earth Science Satellite Remote Sensing: Science and Instrument*, Vol 1. Chapter 2, 33-49, ed. by J. Qu et al., Springer, 2006

Xiong X. and Barnes W.L., "MODIS Calibration and Characterization," Earth Science Satellite Remote Sensing: Data, Computational Processing, and Tools, Vol 2, Chapter 5, 77-97, ed. by J. Qu et al., Springer, 2006

Barnes W.L., Xiong X., Eplee R., Sun J., and Lyu C.H., "Use of the Moon for Calibration and Characterization of MODIS, SeaWiFS, and VIRS," Earth Science Satellite Remote Sensing: Data, Computational Processing, and Tools, Vol 2, Chapter 6, 98-119, ed. by J. Qu et al., Springer, 2006

**** Twenty-five topics authored and/or presented by Biospheric Sciences Branch scientists at the 2006 AGU Meeting in San Francisco, Dec 11-15, 2006!**

--Natural Disaster Scenarios in the Food Security Early Warning Contingency Planning Process: the Role of Remotely Sensed Vegetation and Rainfall Data, Molly Brown (SSAI)

--Quantifying forest disturbance and regrowth in support of the North American Carbon Program, Jeff Masek

--Evaluation of ISLSCP Initiative II FASIR and GIMMS NDVI Products and Implications for Carbon Cycle Science, Forrest Hall (UMBC), Jeff Masek, G. James Collatz

--Global Vegetation 3-D Structure Sampling with Full-Waveform Laser Altimetry, Jon Ranson, Robert Knox, Marc Imhoff

--Thermal Imaging and the Landsat Data Continuity Mission, James Irons, Brian Markham, Marc Imhoff

--Estimating Temperature Retrieval Accuracy Associated With Thermal Band Spatial Resolution Requirements for Center Pivot Irrigation Monitoring and Management, James Irons

--Improving the Black Carbon Optics Module in Global Aerosol Models With Surface Retrievals, Oleg Dubovik and Brent Holben

--A New Web-based Tool for Aerosol Data Analysis: the AERONET Data Synergy Tool, David Giles (SSAI), Brent Holben, Ilya Slutsker (SSAI)

--Ship-based Aerosol Optical Depth Measurements Over the Oceans: Current Status and Prospective, Alexander Smirnov (UMBC-GEST), Brent Holben, Thomas Eck (UMBC-GEST)

--Characterization of the Optical Properties of the Atmospheric Aerosol in Amazônia From Long-Term Distributed Sunphotometry [1993-95; 1999-2004], Joel Schafer (SSAI), Brent Holben, Thomas Eck (UMBC-GEST)

- Ship-based Aerosol Optical Depth Measurements Near Antarctica, Alexander Smirnov (UMBC-GEST), Brent Holben, Ilya Slutsker (SSAI)
- Modeled Aerosol Optical Properties During the SAFARI 2000 Campaign, Brent Holben
- Satellite Monitoring of Asian Dust Storms from SeaWiFS and MODIS: Source, Pathway, and Interannual Variability, Brent Holben
- Optical Properties of Biomass Burning Aerosols In Alaska and Transport of Smoke to Remote Arctic Regions, Thomas Eck (UMBC-GEST), Brent Holben, Aliaksandr Sinyuk (SSAI), Alexander Smirnov (UMBC-GEST)
- Dust and Pollution Aerosol Air Mass Mapping from Satellite Multi-angle Imaging, Brent Holben
- The importance of heterogeneity: integrating lidar remote sensing and height-structured ecosystem models to improve estimation forest structure and dynamics, Jon Ranson
- Variability and Vulnerability of Carbon Cycling in Africa: Diagnosing Controls on Regional Exchanges from Forward and Inverse Modeling, G. James Collatz
- Observed and Simulated Regional North American Vegetation Dynamics: 1982-2005, Chris Neigh (SSAI) and G. James Collatz
- Inverse Model Estimates of Global Carbon Monoxide Emissions Using GMD Network Observations, G. James Collatz and Louis Giglio (UMD)
- Consistency between Surface, Aircraft, and Remote Sensing Measurements of Tropospheric Carbon Monoxide: Implications for Inverse Modeling, Louis Giglio (UMD) and G. James Collatz
- Carbon Fluxes from Land Use-Related Fires in Mato Grosso, Brazil, G. James Collatz
- Recent increases in fire emissions from South America derived from a combination of surface and atmospheric satellite observations, G. James Collatz and Louis Giglio (UMD)
- Laser Sounder for Global Measurement of CO₂ Concentrations in the Troposphere from Space: Update, G. James Collatz
- Determining Ecosystem Light Use Efficiency from MODIS, Fred Huemmrich (UMBC-JCET), Elizabeth Middleton, Forrest Hall (UMBC-GEST), Robert Knox
- Monitoring Start of Season in Alaska (J. Robin, E. Sparrow, E. Levine, and R. Dubayah).

**** Dr. Elissa Levine awarded funding as PI for Interdisciplinary Research in Earth Sciences proposal**

Dr. Elissa Levine was awarded funding as the PI for the Interdisciplinary Research in Earth Sciences proposal entitled "Transformation of larch-dominated forests and woodlands into mixed taiga". Other members of the team include Drs Jon Ranson (614.4), Robert Knox (614.4), Hank Shugart (University of Virginia), Nicole Molders (University of Alaska Fairbanks), Quoging Sun (University of Maryland), and Slava Kharuk (Sukachev Forest Institute). The project addresses biodiversity and disturbance in the larch forests of Siberia and the possibility that these forests are transforming into a zone of mixed taiga. The research approach includes the coupling of a soil moisture and energy model with a forest simulator in combination with remote sensing and field measurements.

**** AERONET Proposal Selected for Funding**

On December 8, 2006 NASA HQ Earth Science Division sent a letter of acceptance for the proposal 'AERONET-The Ground Based Satellite' to be funded through the EOS project Science office at GSFC and HQ's Radiation Sciences Program. The period of performance is October 2006 to October 2010. AERONET has been an evolving program in the Biospheric Sciences Branch officially since 1995 and in reality since 1992. This project's core activity provides ground-based column integrated aerosol optical properties at globally distributed sites to the scientific community and performs research on those data. Evolution of that core theme is evident in the new planned activities:

1. Further enhance the database by:
 - a. Improving cloud screening
 - b. Joint satellite ground retrieval of surface reflectance
 - c. Incorporate polarization model in the inversion
 - d. Include multi-spectral sky polarization observations
 - e. Providing QA for Water leaving radiance observations
2. Expand the Global distribution
 - a. Tropical Asia
 - b. Africa
 - c. Polar Regions in support of IPY activities
 - d. Oceans
 - i. Re-establish SIMBIOS AOD network of routine Handheld ship-based observations
 - ii. Establish new Ocean platform sites for aerosol and standardized Ocean Color validation measurements (SeaPRISM)
3. Support, participate in and lead NASA and NASA related field campaigns
4. Expand the solar flux observational network (SolRad-Net)
5. Provide the synergism with other databases

- a. Enhance the 'Synergism Tool'
 - i. Ground-based observations
 - ii. Satellite-based observations
 - iii. Modeled products
6. Provide new observational directions
 - a. CO2 photometry
 - b. Lunar/star photometry
7. Expand and enhance data access through innovations in algorithm development and web-based applications
8. Provide technical Support for:
 - a. The ~150 PI collaborators and network management collaborators
 - b. Distribution of processing systems world wide
 - c. Calibration facilities of collaborating partners world wide
 - d. Provide appropriate information for the GSFC infrastructure
9. Research, publish and otherwise document all of the above

Currently AERONET has 11 staff, owns approximately 100 sun and sky radiometers, provides ~250 instrument calibrations per year out of the ~300 network sites. In 2006 the AERONET staff had 3 senior author journal articles published, 1 proceeding, and numerous junior author publications. Several senior author papers are in preparation or accepted for publication.

- **SIGNIFICANT ACTIVITIES**

**** Anyamba presents at the World Health Organization (WHO) Conference, Istanbul Turkey**

Assaf Anyamba (Code 614.4) was invited to participate and present at the Joint WHO Intercountry Workshop on Crimean-Congo Haemorrhagic Fever (CCHF) in Istanbul, Turkey from 6 to 8 November 2006. The conference was organized by WHO in co-ordination with the Mediterranean Zoonoses Control Program (MZCP) Athens, Greece, the Eastern Mediterranean Regional Office (EMRO) Cairo, Egypt, the European Regional Office (EURO) Copenhagen, Denmark, the Epidemic and Pandemic Alert and Response Department (EPR) in Geneva, Switzerland, and with the collaboration of the Food and Agriculture Organization (FAO) of UN, Rome, Italy, the World Organization for Animal Health (OIE), Paris and Beirut, and the Integrated Consortium on Ticks and Tick-borne Diseases (ICTTD), Utrecht, The Netherlands. He presented on Monitoring and Mapping Eco-Climatic Conditions associated with outbreaks of Rift Valley Fever and other Arboviruses and provided an overview of likely global diseases outbreak teleconnection patterns during the currently developing ENSO event. WHO recognized his work on disease monitoring by awarding him a Certificate of Contribution to WHO activities.

**** Collatz presents at National Association of Science Writers forum**

Jim Collatz participated in the Goddard hosted visit by members of the National Association of Science Writers on October 31 in the Building 28 lobby from 1:30PM-4:30PM. He presented a poster and discussions on the science of the global carbon cycle and remote sensing approaches for advancing understanding of sources and sinks for atmospheric carbon.

**** Imhoff presents at University of New Hampshire and Houston Advanced Research Center**

Marc Imhoff (Code 614.4) gave an invited seminar at the University of New Hampshire's Complex Systems Research Center in October on the "Use of satellite observations to compare the rate of terrestrial and marine NPP carbon supply and human demand".

He also gave an overview talk on "The continental scale impacts of urbanization on net primary production" at the Houston Advanced Research Center (HARC) in Houston Texas (October 25).

**** Biospheric Sciences Branch Project Receives "GLOBE Star" Commendation**

A recent educational Landsat field validation campaign held at the Delaware Water Gap National Recreation Area in Dingmans Ferry, PA received a "GLOBE Star" commendation from the national GLOBE program in Boulder, CO. The GLOBE Stars recognize projects that make special contributions to the goals of the GLOBE program. The GLOBE program is an international partnership network of K-12 students, teachers, and scientists working together to study and understand the global environment. Since the program started in 1995, students have reported over 14 million data measurements on land cover, phenology, soils, atmosphere and hydrology from 7000 schools throughout the world. A short story on the project is published on the GLOBE program web site at: <http://www.globe.gov/fsl/STARS/ART/Display.opl?star=WaterGap&lang=en&nav=1>

The project was organized and led by Eric Brown de Colstoun, Jessica Robin and Anita Davis from SSAI/Code 614.4 in collaboration with the National Park Service, the Landsat Data Continuity Mission and the Landsat Education and Public Outreach Program.

**** Anita Davis (Code 614.4) participates in several workshops with the National Park Service**

LDCM Education and Public Outreach (Anita Davis, Code 614.4) prepared and co-presented two sessions at the National Association for Interpretation's Annual Conference in November, highlighting the NASA Explorer Institute, Earth to Sky. The conference was attended by over 1200 informal education specialists, representing the National Park Service, US Forest Service, Bureau of Land Management, US Fish and

Wildlife Service, and many state and county park systems, as well as nature centers, zoos, aquaria, and other informal education venues. Earth to Sky is a growing partnership between NASA's Space and Earth Science Divisions and the National Park Service (NPS). The effort is co-lead by LDCM EPO (Anita Davis) and Sun-Earth Connection Education Forum leadership at GSFC and UC Berkeley (Jim Thiemann and Ruth Paglierani), in partnership with leaders in interpretation within NPS.

LDCM EPO lead (Anita Davis) and NPS' Chief of Interpretation for the Alaska Region prepared and presented a full day workshop using the Earth to Sky professional development workshops as a model of effective training about incorporation of science in informal education. Attendees received a wealth of exemplary NASA content for use in interpretive training and programming in their own locations, and took steps toward incorporating presented information to plan their own training efforts in the future. The training was extremely well-received. Best session I ever attended! -participant comment.

LDCM EPO lead (Anita Davis) together with SECEF and NPS partners also prepared and presented a two-hour session demonstrating effective use of NASA science content in a broad variety of NPS informal education media, most of which were created as a direct result of the Earth to Sky partnership. Examples included a nascent on-line tutorial on interpreting global climate change for park visitors; a traveling display and accompanying NPS brochure on climate change in the Parks; a fly-through of Grand Canyon (using Landsat data) created by the Mars Public Engagement team as part of a comparative planetology education effort; and an interactive kiosk exhibit recently installed at Yellowstone, that uses NASA imagery and visualization capability to explain NASA-funded research on Bison migration and management. The climate change display and brochures (a joint NPS-LDCM effort) were available throughout the week-long conference, and proved very popular with attendees. The traveling display will first appear in Alaska parks, and then be available for other parks' use. It is featured on the GSFC Scientific Visualization Studio web site at

<http://svs.gsfc.nasa.gov/vis/a000000/a003300/a003379/index.html>.

The brochures are being distributed to many national parks interpreting climate change throughout the nation. The updated Earth to Sky website launched during the week of the conference features the climate change tutorial (<http://www.earthtosky.org>).

**** Visitors from NOAA/NESDIS visit J. Xiong and MODIS team**

Fred Wu and Changyong Cao (both from NOAA/NESDIS) visited Jack Xiong (614.4) and MODIS Characterization Support Team (MCST) on December 8. They gave two technical presentations (1. Celestial Measurements by GOES Imager and (2. An Overview of Calibration Activities at NOAA/NESDIS). They discussed a broad range of sensor calibration and characterization issues with MCST members.