

B&ESD Newsletter
February 2012

Pubs and Products

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Ganshin, A., Oda, T., Saito, M., Maksyutov, S., Valsala, V., Andres, R. J., Fischer, R. E., Lowry, D., Lukyanov, A., Matsueda, H., Nisbet, E. G., Rigby, M., Sawa, Y., Toumi, R., Tsuboi, K., Varlagin, A., and R. Zhuravlev. 2012. A global coupled Eulerian-Lagrangian model and 1 × 1 km CO₂ surface flux dataset for high-resolution atmospheric CO₂ transport simulations. *Geosci. Model Dev.* 5: 231-243.

Griffiths, N. A., Tank, J. L., Royer, T. V., Warrner, T. J., Frauendorf, T. C., Rosi-Marshall, E. J., and M. R. Whiles. 2012. Temporal variation in organic carbon spiraling in Midwestern agricultural streams. *Biogeochemistry* 108: 149-169.

Iversen, C. M., Keller, J. K., Garten, C. T., and R. J. Norby. 2012. Soil carbon and nitrogen cycling and storage throughout the soil profile in a sweetgum plantation after 11 years of CO₂-enrichment. *Glob. Chang. Biol.* Available online. DOI: 10.1111/j.1365-2486.2012.02643.x

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Russell, L. M., Rasch, P. J., Mace, G. M., Jackson, R. B., Shepherd, J., Liss, P., Leinen, M., Schimel, D., Vaughan, N. E., Janetos, A. C., Boyd, P. W., Norby, R. J., Caldeira, K., Merikanto,

J., Artaxo, P., Melillo, J., and M. G. Morgan. 2012. Ecosystem impacts of geoengineering: A review for developing a science plan. *Ambio* Available online. DOI: 10.1007/s13280-012-0258-5

Weston, D. J., Hanson, P. J., Norby, R. J., Tuskan, G. A., and S. D. Wullschleger. 2012. From systems biology to photosynthesis and whole-plant physiology: A conceptual model for integrating multi-scale networks. *Plant Signal. Behav.* 7(2).

Notable Achievements

Bob Cottingham was invited to participate in the Biosecurity and Biosafety session of the Department of Defense (DOD) Combating Weapons of Mass Destruction Global Synchronization Conference held on February 1st at the National Geospatial-Intelligence Agency (NGA) Conference Center in Springfield, VA.

The Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) Staff, Giri Palanisamy, Ranjeet Devarakonda, and Bob Cook, met with Peter Wittenburg from EUDAT on February 1st. EUDAT is a new and large European data management and cyberinfrastructure project funded by the European Union. The range of disciplines covered by EUDAT is broad: climate change, Earth Science, social science, biomedical, and linguistics. EUDAT has many activities in common with the Earth Science Data and Information System (ESDIS) including: data discovery, metadata, semantics, interoperability, persistent storage, replication, identification, and authentication. They are interested in further collaborations and joining communities of interest. They were especially interested in the Mercury search Tool. Wittenburg was accompanied by Damien Lecarpentier and Daan Broeder of the EUDAT project. Learn more about EUDAT at <http://www.eudat.eu/>.

On February 1st Shahab Sokhansanj participated in a biochar research event in Montreal, Quebec, Canada. The Natural Sciences and Engineering Research Council of Canada (NSERC) funded Strategic National Workshop entitled "Biochar in Canada: Agricultural and environmental perspectives." This one-day workshop brought together key persons representing the relevant expertise in academia, industry and government personnel in order to identify the challenges that must be solved to allow full development of biochar as a soil amendment.

On February 2nd Keith Kline, Debo Oladosu, and Maggie Davis participated in a conference call with researchers from Brazil's Bioethanol Science and Technology Laboratory (CTBE) and the Institute for International Trade Negotiations (ICONE) to discuss a CTBE-ICONE-ORNL partnership focused on linking ORNL's version of the GTAP model (GTAP-DPS) and the Brazilian Land-Use Model (BLUM) for improved land-use change (LUC) analysis.

During February 2nd-21st ORNL staff including Mac Post, Shujiang Kang and Keith Kline participated in a series of meetings related to the development of a Global Bioenergy Crop Model including conference calls with the Global Bioenergy Sustainability (GSB) project leadership in Brazil and the U.S., Jon Foley and the IonE team at University of Minnesota, Lee Lynd and Martin Keller.

Neil Giffen, Michael Ryon and Kitty McCracken, along with other members of the ORNL Natural Resources Team, gave presentations to the Environmental Issues Class of ITT Technical Institute on February 3rd at Oak Ridge National Laboratory. The presentations were followed by a tour of the Environmental Sciences Division (ESD) Aquatics Facility.

Gerald A. Tuskan was selected as Forest Biotechnologist of the Year by the Institute of Forest Biotechnology (IFB). He is the fourth person to receive this award, which recognizes the forest biotechnologist who best exemplifies responsible uses of forest biotechnology and actively promotes science, dialogue and stewardship through their work.

Shahab Sokhansanj has been invited to lead the feedstock theme in a planned Canadian NSERC Strategic Network For Bio-Carbon Research and Application (Bio-C Net). The Network will bring together researchers (U.S. and Canada) to work with partners from government organizations and industry. Three other network themes are Conversion, Utilization, and Standards. The consolidated research efforts will result in the development of a solid scientific basis for standardization of controlled processes and pathways for optimal and economical transformation of low value organic residues into consistent value-added bio-carbon products for different applications. The bio-carbon products include soil amendment (bio-char), energy production (bio-coal), metallurgical applications (bio-coke), a bio-carbon for carbon sequestration, or carbon-based material useful for numerous high-value products and applications.

During February 5th-8th at the Sustainability Symposium organized in conjunction with the 2012 National Biodiesel Conference in Orlando, FL, Keith Kline gave a presentation on “Land-Use Change Analyses and Improving Land Management” and Virginia Dale presented “Potential for Sustainable Deployment of Biofuels.”

On February 6th, 13th, and 14th ORNL contributed to the planning and implementation of three working group (WG) 4 webinars for the International Organization for Standardization (ISO) PC 248 (Bioenergy Sustainability), helped finalize and submit the WG4 final report on the state of science of indirect effects, and provided planning input for the upcoming PC 248 plenary meeting in April. The report provides definitions that suggest which effects could be measured and documented to assist in development of “ISO 13065- Sustainable Criteria for Bioenergy.”

Liyuan Liang and Eric Pierce visited Florida International University for collaborative discussion on mercury characterization studies on February 7th.

On February 8th Keith Kline and Virginia Dale received a Research Innovation Award from the National Biodiesel Conference: “In this age of skepticism and competition for resources, it behooves us to quantify the environmental benefits in methodical and scientific ways. Keith Kline and Virginia Dale are leaders in scientific thought and published research on the true environmental impact of biodiesel and renewable fuels...” Learn more at <http://blog.biodieselconference.org/?p=905>.

The Department of Energy (DOE) has recommended that funding for the BioEnergy Science Center (BESC) be renewed for five more years.

David Watson received funding for an Laboratory Directed Research and Development (LDRD) Launch project, "Real-Time In-Situ Water (& Air) Field Monitor." He is teaming with Jun Xu of the Chemical Sciences Division (CSD) to develop a volatile organic contaminant (VOC) field sensor.

The LDRD Seed Money Fund Project "Strigolactones in the Woody Bioenergy Crop Populus" authored by Jay Chen, Wellington Muchero, Timothy Tschaplinski, and Greg Hurst (CSD), has been approved for funding.

Shahab Sokhansanj organized the following technical events at the Agricultural Equipment Technology Conference that was held in Louisville, KY, on February 12th-14th:

- Mass and Energy Balance - Conservation of mass and energy is fundamental to all processes. Methods of calculating and balancing the calculations on mass and energy balance depend upon the system under study. This workshop details out the methods of accounting for energy and mass inputs, changes in mass and energy with time, losses and outputs. Examples from various energy systems will be presented.
- Fundamentals of Life Cycle Analysis - Life cycle assessment (LCA) is a method of accounting for a particulate attribute or property of a product during the entire life or in some cases a segment of its life. Although LCA was originally designed for calculation of mass and energy input outputs, it is now applied to economics, social, and health related concerns. This workshop provides a consistent method of collecting data, calculations, and interpretation of the results. International standards for LCA including several computer programs for LCA will be introduced.
- Bioenergy R&D Densification of Biomass - Densification of biomass is defined as a process of granulating that would increase the bulk density of biomass to facilitate its handling and transport. The production of pelletized biomass, especially wood pellets, has experienced a dramatic increase in recent years. This increase has brought forth concerns regarding pellet durability, dust and particulate emissions, and human health and safety. Research and development efforts are underway to increase the energy density of pellets by partial carbonization (torrefaction) of pellets. This session was a forum to discuss available and potential technologies for commercial production of and safe handling of cubes, briquettes, and pellets.

As part of an ongoing collaboration between ORNL and Argonne National Laboratory (ANL) on modeling water quality, quantity, and biodiversity, Yetta Jager visited with May Wu and Eugene Yan at Argonne on February 13th.

Madhavi Martin has been appointed into the Governing Board of the North American Society of Laser-Induced Breakdown Spectroscopy. This is a four-year position and the board consists of 10 elected Councilors.

Glenn Cada was invited to present his review of the potential effects of electromagnetic fields (EMF) on aquatic organisms to the Electric Power Research Institute (EPRI) Environment Sector Winter Advisory Meeting in Huntington Beach, CA, on February 14th.

On February 14th Shahab Sokhansanj met with Stuart Daw and Charles Finney. They discussed potential collaborations on research to link modeling of feedstock properties of virgin and modified feedstock to pyrolytic properties of biomass in a thermal reactor (gasifier for example). This research will be done through a doctoral student from Brazil who will be at the Lab shortly and a doctoral student at the University of British Columbia.

The paper, "Massively-parallel rRNA gene sequencing exacerbates the potential for biased community diversity comparisons due to variable library sizes" (*Environmental Microbiology*, 14: 285-290) has been reviewed by the Faculty of 1000. ORNL authors include Chris Schadt and Tom Gihring (formerly at ORNL). The Faculty of 1000 reviews biology and medical research papers selected by its members. The reviewers then rate the papers and explain their relevance. Read the original research paper at <http://onlinelibrary.wiley.com/doi/10.1111/j.1462-2920.2011.02550.x/full>. Learn more about the Faculty of 1000 at <http://f1000.com/>.

The Winter 2012 issue of the ORNL DAAC Newsletter has been released. Read it online at

http://daac.ornl.gov/news/DAAC_newsletter_Winter12.pdf

On February 15th Shahab Sokhansanj and Robert Grisso (Virginia Tech) met and discussed their on-going research projects. Specifically their discussion centered around the development of a publishable paper that would describe sensitivity of the costs to yield for harvest agricultural crops and residues: “A New Model for Quantifying the Sensitivity of Collection Costs to Biomass Yield.” Robert and Shahab also discussed the development of a paper on the impact of billion-ton biomass on the development of agricultural equipment industry. Is the existing equipment adequate? If not what would be the characteristics and quantity of new equipment to support the national vision on biofuel development.

Also on February 15th Shahab Sokhansanj and Robert Grisso met with Phil Nugent of the Knowledge Discovery Framework (KDF) Group to discuss the potential of including the probability of working day (working day for harvest and collection equipment) as well as biomass dry downs in the KDF. In addition to incorporating the Integrated Biomass Supply and Logistics Model (IBSAL) in KDF such that a user can download a demo or runtime programs to run the models within KDF. It was concluded that the IBSAL models would be supplied to KDF group to test their inclusion in the framework.

On February 16th Virginia Dale joined the first conference call on the forest chapter author team of the National Assessment of Climate Change. Virginia’s contribution will be focused on the bioenergy aspects.

The ORNL DAAC held a monthly telecon with staff from the Large-scale Biosphere Atmosphere- Ecology (LBA-ECO) project office on Thursday, February 16th, to discuss relevant issues pertaining to the archival of LBA-ECO data sets including status of submissions to the ORNL DAAC for archival. Learn more about LBA-ECO at <http://www.lbaeco.org/lbaeco/about.htm>.

On February 16th Shahab Sokhansanj visited with Alvin Womac of University of Tennessee. Alvin is the principal investigator on Genera’s bulk handling of switchgrass project. He and Shahab travelled to Vonore, TN, the site of the Genera feedstock handling and processing and bioethanol production. They visited the two newly installed concrete silos for storing field chopped and tub-grinder chopped switchgrass. The ground biomass is reclaimed from these silos for further handling, grinding, and compacting for low cost transport. They also visited Brad Balck’s farm where switchgrass is mowed, chopped and loaded onto trucks for transport to the Vonore site. Under a collaborative research arrangement, data from the Genera project are used in IBSAL for developing a uniform analysis of the five DOE-sponsored logistics projects.

The Biological and Environmental Research Information System (BERIS) has won awards of Distinction and Merit in the Society for Technical Communication (STC), Washington, D.C., Chapter’s 2011–2012 Summit Competition. These communication tools were prepared for DOE’s Biological and Environmental Research (BER) Program. Entries and their ratings are (1) technical publication, *Grand Challenges for Biological and Environmental Research: A Long-Term Vision* (Award of Distinction, the highest rating) and (2) online technical communications, the Department of Energy Genomic Science Program (Award of Merit, <http://genomicscience.energy.gov/>). The publication has been automatically entered in STC’s Summit Awards International Competition (results pending). BERIS entrants are Jennifer Bownas, Kris Christen, Holly Haun, Judy Wyrick, Marissa Mills, and Sheryl Martin, led by Betty Mansfield. Others receiving awards for the document are ORNL’s Brett Hopwood and Gary

Stacey of the University of Missouri (Chair, DOE Biological and Environmental Advisory Committee).

On February 21st Baohua Gu gave an invited talk in the department of Civil and Environmental Engineering at the University of California, Los Angeles, on "Biogeochemical transformation of mercury (Hg) and perchlorate (ClO₄⁻) in the environment."

During February 22nd-24th Virginia Dale and Matt Langholtz presented a talk on "Environmental and socioeconomic indicators for bioenergy sustainability as applied to Eucalyptus" at the symposium on "Assessment and Management of Environmental Issues Related to Eucalyptus Culture in the Southern United States." Matt also displayed a poster entitled "Harvest Scheduling of *Eucalyptus* spp. In Florida for Economic and Environmental Optimization." The symposium was organized by the United States Department of Agriculture (USDA) Forest Service and the National Council for Air and Stream Improvement, Inc. (NCASI) in Charleston, SC.

On Thursday February 23rd Aleisa Bloom received the 2012 Technologist of Distinction award from the College of Engineering at Tennessee Tech University. Read more about Aleisa and her award in the *News Sentinel* article at <http://blogs.knoxnews.com/munger/2012/02/tennessee-tech-honors-ornl-bl.html>.

Michael Ryon and Kitty McCracken, along with Pat Parr of the ORNL Natural Resources Team, attended the winter meeting of the Tennessee Exotic Pest Plant Council on February 24th at Cumberland Mountain State Park.

During February 24th-27th Esther Parish attended the Annual Meeting of the Association of American Geographers (AAG) Conference in New York City.

Shahab Sokhansanj continued working with Nexterra and the biomass combined heat and power plant at the University of British Columbia. He and his graduate students developed characteristics of a blend made up of residues from construction sites (spruce, pine, fir – spf) and western red cedar. The composite sample met all compositional requirements of Nexterra gasifier except a slightly higher chlorine content. The team also developed a specially designed screen to fractionate the 3" inch particle. 1/4" particles were fractionated on a Gilsson wire mesh screen. The combined heat and power (CHP) plant will be fired around April 1st.

On February 26th the article, "Downstream mercury in Poplar Creek, Clinch River reflects Y-12 discharges" appeared in the *News Sentinel*, including a quote from Mark Peterson. Read the article online at <http://blogs.knoxnews.com/munger/2012/02/downstream-mercury-in-poplar-c.html>.

BESD New Arrivals

No new staff or post-grads.