FluxLetter

The Newsletter of FLUXNET

Vol. 1 No. 3 *October*, 2008

Highlight FLUXNET site
FFPRI

Forestry and Forest Products Research Institute, Japan
by Yoshikazu Ohtani

FFPRI (Forestry and Forest Products Research Institute) FluxNet sites are located at the main Japanese islands of Hokkaido and Kyushu ranging from 43°N to 33°N in latitude. The sites are: Sapporo site (SAP; temperate white birch forest), Appi site (API; temperate beech forest), Kawagoe site (KWG; temperate deciduous broad-leaved forest), Fujiyoshida site (FJY; temperate pine forest), Yamashiro site (YMS; temperate mixed forest on complex terrain), and Kahoku site (KHW; temperate Japanese cedar forest on complex terrain). FFPRI started the flux observation of heat, water vapor and carbon dioxide at the Kawagoe site in 1995. After the establishment of the fundamental instrumentation, the observation was extended to other six forest sites. This group of sites is named FFPRI FluxNet, since 1999.

The climate of this region is generally characterized by apparent seasonal changes and precipitation affected by the East Asian monsoon including a worldwide heavy-snowfall area. The annual NEP (net ecosystem productivity) observed by eddy covariance method ranged from 250 to 550 gC $m^{-2}y^{-1}$ at the FFPRI FluxNet sites. The maximum productivity has been found in the temperate beech forest (API), but it had large inter-annual variability. In the coniferous forests, the balance of carbon assimilation and respiration induced by seasonal changes in solar radiation and air temperature was an important factor. In contrast, at the deciduous broad-leaved forests, solar

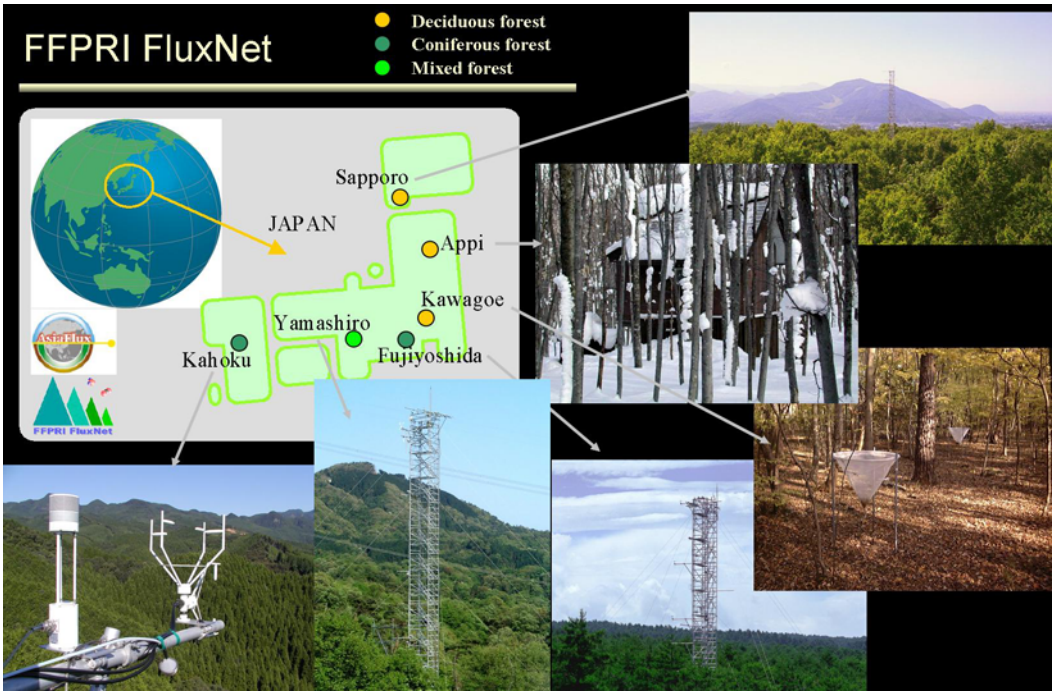

Figure 1: Flux towers and forests in FFPRI FluxNet, Japan. The FFPRI FluxNet includes temperate deciduous, coniferous and mixed forests.

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radiation and the duration of the growing season were important factors with regards to annual NEP. Additional detailed process based observations such as the respiration from coarse woody debris (CWD) and plant root dynamics have been conducted in some sites. Recently, the field measurements of isoprene emissions from *Quercus* leaves have been also conducted at the YMS site, and the results showed that the isoprene emission rate peaked at around noon (from 25.5 to 48.0 nmol m^{-2} s^{-1}).

As a member of the international flux community, we would like to fulfill our responsibilities for the better understanding of the ecosystems and for our future.

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further information see:

http://www.ffpri.affrc.go.jp/labs/flux/

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"FFPRI started the flux observation of heat, water vapor and carbon dioxide at the Kawagoe site in 1995. After the establishment of the fundamental instrumentation, the observation was extended to other six forest sites. This group of sites is named FFPRI FluxNet, since 1999. "

Figure 2: FFPRI team

Editorial: **Whither Co-Authorship?**

Dennis Baldocchi and Rodrigo Vargas

Since the early days of the FLUXNET project the publications with multiple authors have been a hall-mark of the project. In many ways these extensive use of co-authorship has acted as a 'glue' that has fostered collaboration and fostered the growth of the network. In those halcyon days (*circa* Marconi 2000 workshop), multi-authored papers were necessary because data were generally new and unpublished. And multi-authored papers were possible to produce because the number of co-authors was relatively small (typically less than 10); our experience deems that there is a critical group size (5-10) where most individuals in a group are able to contribute to the intellectual development, analysis and writing of a paper.

With the advent of the new LaThuile dataset (200+ sites, 900+ years of data, and hundreds of potential collaborators) we face new opportunities and challenges in writing papers as groups or sub-groups. The good news is that we have an unprecedented dataset on the 'breathing of the biosphere'. In addition, collaboration, data sharing and co-authorship is aided by rapid communication and interchange via the internet. On the other hand, we face many challenges in writing the next generation of FLUXNET papers, which may be stymied by the logistics and efficacy of interacting with many potential collaborators from many cultures.

The question we face at this stage is whether or not the next generation of papers should expand to include: 1) all data contributors as authors; 2) a core group who provided the key intellectual inputs by processing and analyzing the data and writing the paper; or 3) a combination of choices 1 and 2?

The problem of data sharing and extensive co-authorship is not new in the scientific community. The International Committee of Medical Journal Editors (ICMJE) recommends that: "Authorship credit should be based on: 1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content, and 3) final approval of the version to be published. Authors should meet conditions 1, 2, and 3."

"...we face many challenges in writing the next generation of FLUXNET papers, which may be stymied by the logistics and efficacy of interacting with many potential collaborators from many cultures."

There is no clear answer to the question regarding co-authorship of FLUXNET papers as there are many cultural, ethical and practical hurdles we must navigate. In this editorial we outline some of the pros and cons of having extensive author lists. We hope to provide some guidelines and suggestions for co-authorship that will be viewed as fair and suitable to a majority of the FLUXNET community.

What are the **pros** of having many co-authors?

1) There is much intellectual input in writing research proposals, installing and maintaining sets of complex instruments, collecting the flux data and metadata, processing the data, gap filling and partitioning the flux data.

2) Co-authorship is a 'goodie' that encourages continued network collaboration and timely data submission.

3) It increases the intellectual capital of the paper; more brains working together on an idea increase its value; and it leads to the open-source 'LINUX effect' where the quality of the data product improves as more eyes view and use the data.

4) Collaborating PIs know their site best and can advise on how best to use the data.

5) Co-authorship highlights data from the sites and shows the funding agencies the wide value of these data.

6) The citations to the paper will grow with time as more individuals are involved in the effort.

7) It can help foster the career of younger scientists.

What are the **cons** of writing papers with extensive author lists?

1) Data may have been published or were collected with government support and are legally open access.

2) Acquiring input and feedback from hundreds of individuals can be a major impediment on producing a new paper in a timely and efficient manner; there are cultural and personal issues regarding authorship expectation, diverse network rules, absence of potential authors due to travel and vacation, or lack of response.

3) Many co-authors may get recognition for relatively little effort to the intellectual product of the paper beyond the submission of data which they (or their postdoc or student) may have acquired and processed.

4) Expectations of wide authorship may hamper wider use of the network's data from modelers and policy analysts and stakeholder.

5) Omitting certain teams or individuals could have deleterious effects and decrease collaboration.

6) It could be a poor example to young scientists; one may expect

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co-authorship for little input besides helping collect data or editing a manuscript.

7) There is a risk that ideas spread to a wide group, before formal publication will be cooped.

We hope we can resolve this question by holding ourselves accountable to certain ethical and professional standards regarding our acceptance or refusal of co-authorship. Many journals, like *Nature* and PNAS, are starting to ask the authors to identify their contribution to the paper. In these journals, contributors are required to identify their role in one or more of the following: designing of the research, perform the research, contributed with new analytic tools, analyze data and/or writing the paper. This designation may be a good start to inform the readers and eliminate gift authorship [*Cozzarelli*, 2004].

Should we aim to develop a new cultural norm regarding co-authorship? For example, if we are asked to contribute to a paper we should make an extensive effort to contribute in terms of text, insights, interpretation and quick and timely review of manuscripts. And if one feels their contribution is minor and the data have been published, the individual should be confident enough to advise the lead author that he or she does not need to be a co-author. In this case, citing the key papers on the site and its data may be sufficient documentation. In the end it will be up to the individuals and the collective network to sort this issue out, but it is a topic we must deal with and resolve. And in the end the resolution may evolve with time where datasets themselves can be published and cited and it is adequate for the data provider to inform their agency support that the work has been used in such a paper.

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Figure 1: Understory of the Hainich FLUXNET site. (Photo credit Dennis Baldocchi)

Re-thinking Global Change Science: From Knowledge to Policy

7th International AsiaFlux Workshop in Seoul, Korea

Joon Kim

Dreaming and embracing a vision is the greatest motivator of humanity. It provides us with the power to hope beyond the majority and the present – an ability to believe in an unseen future. In a nutshell, vision is foresight with insight based on hindsight.[1] As the new chair, I am simply overwhelmed not only by the privilege and responsibility of the role to play but also with a grateful heart for the former chairs – Drs. Y. Fukushima, S. Yamamoto, and Y. Ohtani. It is reassuring to witness these visionary leaders who not only know where they are going, but also invite us to pave the way with them.

The AsiaFlux is a science community with a mission to "bring Asia's key ecosystems under observation to develop and transfer scientific knowledge to ensure quality and sustainability of life on earth." Our purposes are to (1) develop collaborative researches and data sets on the cycles of carbon, water and energy in key ecosystems in Asia; (2) organize workshops and training on current and related global climate change themes; and (3) cultivate the next generation of scientists with skills and perspectives to address global climate change in Asia as informed leaders and stewards. Our vision is to serve as the "science frontier" in carbon, water and energy cycles, developing and transferring scientific knowledge characterized by consilience[2], contextualization[3] and cultural diversity.

During the 17th-19th of November 2008, we will celebrate our 10 years' science, service and stewardship, by hosting the 7th International AsiaFlux Workshop, entitled "Re-thinking Global Change Science: From Knowledge to Policy," at the Press Center in Seoul, Korea (www.asiaflux.net/ws2008/). In addition to our regular science sessions, various special sessions are being organized to set an example for capacity building such as CarboEastAsia, HydroKorea, and Asian Carbon Trackers' Society (ACTSociety). As indicated by the theme title, the workshop will provide a great opportunity for scientists, policymakers, and the public to better understand the latest scientific achievements. Furthermore, it will help develop educational, technical, and socio-economic resolutions to prevent and mitigate the risk of human-induced climate change associated with carbon, water and energy cycle in Asia.

"During the 17th-19th of November 2008, we will celebrate our 10 years' science, service and stewardship, by hosting the 7th International AsiaFlux Workshop, entitled "Re-thinking Global Change Science: From Knowledge to Policy," at the Press Center in Seoul, Korea (www.asiaflux.net/ws2008/)"

We have the potential to help make the shift to a sustainable global trajectory that will ensure the survival and quality of life of humans and other species that share the planet with us. May our vision become reality and impact our generation and the generations to come. Why don't you join us to make the difference?

For further information see: *http://www.asiaflux.net/ws2008*

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Literature

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Highlight Graduate Student

Mi Zhang

My name is Mi Zhang and I was born in 1980 in the Shannxi province of China. In 2002, I graduated from Northwest Agriculture and Forest University, Yangling, Shannxi Province and gained a B.AG. and a major in Water and Soil Conservation. In 2006, I graduated with a M.S. from the Institute of Applied Ecology, Chinese Academy of Science, Shenyang, Liaoning Province, with a major in Ecology. My dissertation was "Simulation of photosynthetic productivity of the canopy of Broad-leaved and Korean-pine forest in Changbai Mountain".

Since 2006, I have been a PhD candidate at the Institute of Geographic Science and Nature Resource Research, Chinese Academy of Science, Beijing, China, with a major in Ecology and I am performing research on "Multi-Temporal Scales Analysis of Control of Environmental and Biotic Factors of Forest Ecosystems Carbon Exchange". In this research, I will use five years data of eddy covariance flux and meteorological measurements from two forest ecosystems of ChinaFLUX, temperate broad-leaved Korean pine forest in Changbai Mountain and subtropical evergreen broad-leaved forest in Dinghushan. The main objectives of this research are: a) to explore the relationship between environmental, biotic factors and carbon budget of two forest ecosystems in different time scales, and b) to seek the conversion rules of the environmental and biotic factors that controls the carbon budget of the two forest ecosystems with the change of time scales.

My current study is to analyze the responses of net ecosystem exchanges(NEE) of carbon dioxide to changes in cloudiness in temperate broad-leaved Korean pine forest in Changbai Mountain and subtropical evergreen broad-leaved forest in Dinghushan. I found that the light-saturated maximum photosynthetic rate of temperate broad-leaved Korean pine forest could be enhanced on cloud days compared with those on clear days. When the sky was covered by middle cloudiness, the value of clearness index (k_t) was about 0.5, NEE of this ecosystem reached its maximum, but in subtropical evergreen broad-leaved forest, the light-saturated maximum photosynthetic rate did not improved obviously on cloud days compared with those on clear days, and the NEE of this forest ecosystem was more higher when the sky was more clear. Therefore, the increased diffuse radiation by cloud in the sky was more benefit to temperate broad-leaved Korean pine forest than to subtropical evergreen broad-leaved forest

The four pictures of Figure 1 were shot when I worked in our field site of ChinaFLUX. One of these pictures was shot when I measured the photosynthesis of dominant species of Broadleaved Korean pine forest in Changbai Mountain site in grow season 2005; one of these pictures was shot when I took part in the calibration of Li-7500 of eddy covariance measurement system in Dinghushan site in August 2006; two of these pictures were shot when I took part in the calibration of Li-7500 of eddy covariance measurement system in two grassland sites, Damxung site and Haibei site in June 2008.

For further reading:

"The Effects of Solar Radiation on Net Ecosystem Exchange of Broadleaved Korean Pine Mixed Forest in Changbai Mountain" is my relevant paper, which was accepted by Journal of Plant Ecology (Chinese Version).

The main contents of this paper were to quantify the changes in solar radiation that was affected by cloudiness and analyzing the responses of net ecosystem exchange of forest ecosystem to this change. The 30 min flux data and routine meteorology data in mid-growing season (from June to August) of broadleaved Korean pine mixed forest in Changbai Mountain in the years from 2003 to 2006 were used. The main findings are:

(1) The light-saturated maximum photosynthetic rate of this ecosystem was enhanced 34%, 25%, 4%, 11%, respectively in cloud days compared with clear days in mid-growing season in 2003, 2004, 2005 and 2006, respectively; (2) When the sky was covered by middle cloudiness, the value of clearness index (k_t) was about 0.5, NEE of this ecosystem reached its maximum; (3) When the relative irradiance was over critical relative irradiance, that was about 37%, the enhancement of NEE occurred, and this forest ecosystem had maximal NEE when the optimal relative irradiance was about 75%. Furthermore, the enhancement of NEE was ascribed to the enhancement of canopy assimilation and the decrease of respiration above ground, which was resulted from the increase of diffuse radiation and the decrease of air temperature and vapour pressure deficit with a certain increase of cloudiness.

Figure 1: Mi Zhang working in field sites of CinaFLUX

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Highlight Young Scientist

Serena Marras

My name is Serena Marras, and I was born and grew up in a town located on the north coast of Sardinia, Italy, which is a large Island in the center of the Mediterranean Sea. I have two passions: music and nature. I have studied and taught piano for long time, and I graduated with a degree in Agricultural Science from the University of Sassari, Italy. I finished my PhD in Agrometeorology and Ecophysiology of Agricultural and Forest Ecosystems this year, and I am now working as a post-doc for the University of Sassari, Department of Economics and Woody Plant Ecosystems (DESA).

My early research activity focused on methods to estimate fluxes between vegetation and atmosphere. I worked on the application of the Eddy Covariance (EC) and Surface Renewal (SR) micrometeorological techniques to estimate energy and mass exchanges between vineyards and shrubland vegetation and the atmosphere (Spano et al., 2006; Spano et al., 2008). My study of the EC technique was facilitated by a summer school in Belgium, organized by CARBOEUROPE group. I focused my study on flux data processing, quality control, and gap filling of EC data series. Currently, I am contributing to the eddy flux data analysis at the Le Prigionette site (Sardinia, Italy). Le Prigionette is a Mediterranean maquis site with sclerophyllous dominant species. The EC and SR tower is managed in cooperation with the Italian Research Council - Institute of Biometeorology (CNR-IBIMET), Sassari, Italy, which is coordinated by Dr. Pierpaolo Duce. I also worked on agricultural ecosystems, contributing to the collection and analysis of flux data taken over grapevines in Tuscany. This work was part of a national project conducted in cooperation with other Italian Universities and funded by the "Italian Ministry of Education, University and Research".

Figure 1: Serena and a troll in Sonoma, Napa Valley, CA, USA

For my PhD project, I focused on modelling energy, water and carbon fluxes in Mediterranean Maquis and agricultural ecosystems. I used an elaborate higher-order closure model for flux modelling: the Advanced Canopy-Atmosphere-Soil Algorithm (ACASA) model (Pyles et al., 2000), which was developed at the University of California, Davis. The study of ACASA model was possible thanks to collaboration with the University of California, Davis (UCD), Department of Land, Air and Water Resources (LAWR), where I had the fortune to visit for one year. The model was mainly evaluated over dense canopies (Pyles et al. 2000, 2003) in the past, so the aim of my work was to test the ACASA model ability to estimate mass and energy flux over sparse canopies. Therefore, I calibrated and validated the ACASA model by comparing with our data collected over sparse maquis and grapevine canopies. Use of the ACASA model to predict energy and mass fluxes between the vegetation and atmosphere is promising, and it could greatly improve our ability to estimate fluxes for use in carbon balance studies. When I presented the results of my work (Marras et al., 2008) at the American Meteorological Society - Agriculture and Forest Meteorology Conference in Orlando in May, I received the first place in the student paper competition. I would really thank my Prof. Donatella Spano, Prof. Kyaw Tha Paw U, and Dr. Richard Snyder who helped and directed me to comprehend and work in the 'biometeorology world'.

> *"I have two passions: music and nature "*

My next step will be to use ACASA model in an urban environment. In fact, I will be involved in an European project on urban metabolism. Currently, I am also interested in climate change and I am cooperating with the Euro-Mediterranean Centre on Climate Change (CMCC) to study the impacts of climate change on agricultural and natural ecosystems. However, the real challenge will be to find time to play and teach piano in the future!

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Fuel cell provides backup power at Loobos site

Jan Elbers

Recently a Direct Methanol Fuel Cell has been installed at the Loobos site in the Netherlands. The Loobos site is at a remote location in the middle of an extensive pine stand, without access to main power (see *http://www.loobos.alterra.nl*). The central power source is a set of solar panels (600 W) and a small wind-generator (120 W) in combination with a set of batteries. During winter these energy sources are sometimes not generating enough power to keep the measurements systems running. To overcome such periods, a fuel cell is installed, that is switched on automatically when battery voltage falls below a certain level.

"Direct-methanol fuel cells or DMFCs are a subcategory of proton-exchange fuel cells where the methanol (CH3OH) fuel is not reformed as in the indirect methanol fuel cell, but fed directly to the fuel cell operating at a temperature of ca. 90 - 120 °C . Because the methanol and water is fed directly into the fuel cell, methane reforming is not required. Storage of methanol is much easier than for hydrogen as it does not need high pressures or low temperatures, because methanol is a liquid from -97.0 °C to 64.7 °C (-142.6 °F to 148.5 °F). The energy density of methanol - the amount of energy contained in a given volume - is an order of magnitude greater than even highly compressed hydrogen. The waste products with these types of fuel cells are **carbon dioxide** and water." (Direct methanol fuel cell. (2008, September 10). In Wikipedia, The Free Encyclopedia. Retrieved 13:10, September 10, 2008, from: *http://en.wikipedia.org/w/index.php?title=Direct_methanol_fuel_cell&oldid=237505556*

Figure 1: Direct methanol fuel cell installed at Loobos site

Output power of the fuel cell depends on battery voltage and ranges between 4.5 (nearly full battery) and 6.2 Ampères (nearly empty battery) at a nominal 12 VDC. According to the manufacturer fuel consumption is 1.3 liter per 100 Ah, thus when running at full power around the clock the system will consume around 2 liters of methanol per day. In our case Methanol is provided in a 28 liter container which has to be replaced when nearly empty, smaller containers or several containers in parallel are also possible.

Our measurement systems consume about 2 Ampères continuously so the current from the fuel cell is not enough to significantly charge the 600 Ah lead-acid battery pack. It will however keep the instrumentation running until weather conditions are more favorable for power output from the solar panels / wind generator. Since installation last winter we have seen the fuel cell in operation only during nights in prolonged overcast periods.

It is worth noting that this fuel cell unit will not operate and may even get damaged at temperatures below 0° C. The unit can keep itself warm at temperatures below 3° C as long as it is connected to a working battery and it is supplied with methanol. Long cables from the unit to the batteries should be prevented, the higher the voltage drop from unit to batteries the lower the power output of the unit.

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FluxLetter
The Newsletter of FLUXNET

Vol.1 No.3 October, 2008

FluxLetter is produced quarterly at the FLUXNET Office with support from the National Science Foundation.

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We plan to make the FLUXNET newsletter a powerful information, networking, and communication resource for the community. If you want to contribute to any section or propose a new one please contact the FLUXNET Office. THANKS!!