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# AsiaFlux Newsletter

## Contents

Role of AsiaFlux Newsletter

Aim of the CO<sub>2</sub> Flux Measurements Network in Different Forest Ecosystems in East Asia

The 2nd AsiaFlux Workshop to Advance Understanding of Ecosystem Fluxes in Asia

Report of the FLUXNET Meeting Held in San Francisco

Report of the Inspection on Flux Measurement

by Members of the Chinese Academy of Science

Japanese-American International Comparison Measurements, August 2001

AsiaFlux Logo

## Role of AsiaFlux Newsletter

Gen INOUE (Center for Global Environmental Research,  
National Institute for Environmental Studies)



Nowadays, the projects joining to the AsiaFlux Network are increasing in number, and the individual projects are already ongoing or under the preparation. So, the AsiaFlux Network is moving from the stage of ignition to the operation mode. It is a timely decision to issue the AsiaFlux Network News periodically to exchange the information and to enhance the cooperation.

The Global carbon Cycle Joint Project of IGBP, WCRP and IHDP is just starting up formally, and the AsiaFlux Network is expected to be one of the important

research framework of this project, especially to answer the question; "What are the geographical and temporal patterns of carbon sources and sinks?" The flux observation network should cooperate with other activities, such as a process study of carbon cycle within the forest, a remote sensing to map the forest canopy image spectra, and the boundary layer atmospheric measurement. The measurements of key isotopes and oxygen budgets, nitrogen cycle and others will give us a better understanding. So, this Newsletter will offer important information to the scientists outside of flux measurement itself, but who are concerned with the carbon cycle.

It should be emphasized that the network will be active only when the participants will get some benefits contributing to the network. The key of success is to give and take the technical information, the data themselves and the method of data analysis under the spirits of equality and reciprocity. This function of this Newsletter is significant, and I hope your contributions.



## Aim of the CO<sub>2</sub> Flux Measurements Network in Different Forest Ecosystems in East Asia

Susumu YAMAMOTO (AsiaFlux Steering Committee Vice-chair,  
National Institute of Advanced Industrial Science and Technology)

The Kyoto Conference was held in December 1997 in order to understand clearly what the effectiveness of the forest ecosystem contribution is in the absorption and fixation of air CO<sub>2</sub>. This incorporated the Third Session of the Conference of Parties to the U.N. Framework Convention on Climate Change (COP3). From there on, this topic has become a very important point of discussion. In November 2001 in Marrakech, Morocco at the COP7 in agreement with the rules of the Kyoto Protocol and in accordance with forest management, the objective of reducing the air CO<sub>2</sub> by increasing the absorption source was determined. However, the role of the CO<sub>2</sub> balance in a forest ecosystem has not yet been scientifically clarified.

In order to deal with this problem scientifically, the CO<sub>2</sub> flux between the atmosphere and the forest ecosystem is being measured using measurement towers around the world by different research institutions and universities. Thus, the relationship between CO<sub>2</sub> flux - Meteorological conditions and the seasonal and annual change of carbon balance are being investigated. The variables being measured by the measurement tower are: CO<sub>2</sub> flux between the atmosphere and the forest ecosystem; CO<sub>2</sub> concentration, heat and water vapor fluxes and meteorological variables such as air temperature, wind, humidity and solar radiation. Furthermore, in the same site the forest biomass, tree species, crown height, Leaf Area Index, Soil water content, temperature, soil respiration, shedding of leaves, amount of dead branches and the decomposition rate are being investigated. In Europe and America, EUROFLUX, AmeriFlux and MedeFlu have started flux measurement networks several years ago. With the cooperation of these multi-regional flux measurement networks the FLUXNET project is to construct a database and to exchange vegetation data on an international scale.

### [Condition of AsiaFlux Network]

Now, what is the condition of the flux measurement network in Japan and Asia? The Asian region, in particular Japan, is comparatively more complicated than that in Europe and America. Furthermore, the monsoon and the intensive rain climate add uniqueness to this region. For these reasons, Europe and America requested flux measurements and the accumulation of data in Asia. Based on this, research centers and universities in Japan united efforts aimed to construct a flux measurement network in Asia (AsiaFlux). In September 1999, the steering committee of AsiaFlux was launched and its homepage was published in February 2000. Furthermore, under the direction of the steering committee the AsiaFlux First International Conference was held in Hokkaido University in September 2000. The aim of this international conference was to introduce the AsiaFlux to Japan and to the world and to mutually verify the conditions of the AsiaFlux measurement sites and their problems. Up to that time, Japanese researchers carried out the activities of the AsiaFlux. However, keeping in mind the different ecosystems in East Asia and the importance in the assembling of a flux measurement network, this effort was not enough. For that reason, a flux measurement project started in China and the AsiaFlux Second International Conference co-sponsored by the AsiaFlux and the Koflux (Korean Flux Measurement Network) steering committees was held in Jeju Island, Korea (January 2002). Furthermore, Japan, Korea, China and Thailand are cooperating to widen the AsiaFlux network ring in East Asia rapidly.

### [New Development of the AsiaFlux]

In the Second AsiaFlux International Conference and other AsiaFlux meetings of the last year, it was agreed to carry out the following actions to develop AsiaFlux



activities

- (1) Participation and cooperation of researchers from Korea, China, Thailand and Russia in the management of the AsiaFlux.
- (2) Strengthening the advertisement of the AsiaFlux activities domestically and overseas and the publication AsiaFlux Newsletter.
- (3) Standardization of the measurement and analysis methods in the AsiaFlux and mutual comparison of methods around the world.
- (4) Establishing a database of the results of AsiaFlux and promoting the spreading of this system.
- (5) Make use of climate models, ecology models, analy-

sis of satellite data and database in the AsiaFlux.

Although the AsiaFlux focuses on CO<sub>2</sub>, it is also within the view of it to analyze the role that vegetation plays in the matter balance of the environment. In order to understand these processes, it is important to promote the measurement of methane, water vapor and heat fluxes in the measurement sites. AsiaFlux is formed as a voluntary network with the support of many research institutions, universities Flux measurement groups and researchers interested in Fluxes. AsiaFlux is moving to operation stage and the support of participating researchers on flux measurements is thus necessary.

## The 2nd AsiaFlux Workshop to Advance Understanding of Ecosystem Fluxes in Asia

Chaesik Rho (National Academy of Science, Korea)  
Joon Kim (Yonsei University)

AsiaFlux, the Asian arm of FLUXNET, held its Second International Workshop on Advanced Flux Network and Flux Evaluation on 8-11 January 2002 in Jeju Island, Korea. One of the highlights was the launching of the Korean network, KoFlux ([www.koflux.org](http://www.koflux.org)), to advance comprehensive Asia-wide studies of Ecosystem fluxes. A total of 110 scientists and policy makers (from Australia, China, Japan, Korea and U.S.A.) had participated in this workshop.

On the evening of 8 January, three-hours long "Ice Breaker" paved the way to the exciting opening of the second AsiaFlux workshop through closer and responsive interactions among the participants. On 9 January, the meeting officially started with the welcoming addresses of Dr. Susumu Yamamoto (Co-Director of AsiaFlux), Prof. Chaesik Rho (Director of KoFlux), and other representatives of the sponsoring organizations (i.e. Korea National Institute of Environmental Research, Korea Meteorological Research Institute, Korean Meteorological Society, and Korean Society of Agricultural and Forest Meteorology). For two full days, a total of 80 papers were presented. During the

Special Session, four papers were presented on the current status of FLUXNET, AsiaFlux, OzFlux and KoFlux. The subsequent Oral Sessions included 22 presentations on four topics: (1) current activities in AsiaFlux domain, (2) current issues in flux measurement, (3) long-term CO<sub>2</sub> flux observation, and (4) biogeochemical cycle. Two-minute oral presentations on selected posters facilitated the Poster Session, in which a total of 54 papers were presented.

On the same evening of 10 January, an official business meeting was held for KoFlux and China flux network cooperation with AsiaFlux. Twenty-six representative scientists from China, Japan and Korea gathered in this meeting and agreed on the following items: (1) publishing AsiaFlux newsletters and a guidebook for standard flux measurement, (2) intercomparing field experiments including software among the participating sites, (3) recommending China to host the 3rd AsiaFlux workshop in 2003, (4) preparing proposals to international organizations for flux training workshops or programs, (5) initiating a long-term collaborative project to advance flux network in Asia, and (6) submitting an



overview paper led by Drs. Yoshinobu Harazono and Joon Kim on the workshop results to a peer-reviewed international journal.

Each day during the workshop, a special lunchtime lecture was offered. Drs. Ray Leuning and Dennis Baldocchi provided lectures on rationale for flux measurements and strategy for flux integration, respectively. Drs. Akira Miyata and Hongsung Zhang co-hosted a unique gathering for young scientists in AsiaFlux, with a special guest adviser, Dr. Tom Denmead. This informal meeting attracted more than 40 young scientists for joyful partnership among the AsiaFlux community.

With great hopes and promises, the Second AsiaFlux Workshop was successfully completed by farewell addresses of Professors Yoshihiro Fukushima and Chaesik Rho. AsiaFlux's concerted effort will continue to improve understanding of the carbon sources and



sinks of terrestrial ecosystems, thereby improving predictability and adaptability to current global changes and aiding the decisions of the Asian community in the context of the Kyoto protocol. Certainly, we all look forward to meeting our friends again in our next gathering in 2003 in China!

## Report of the FLUXNET Meeting Held in San Francisco

Takashi HIRANO (Hokkaido University)

Nobuko SAIGUSA (National Institute of Advanced Industrial Science and Technology)

The Autumn general assembly 2001 of AGU (American Geophysical Union) was held in December in San Francisco. Preceding that, a meeting was held at the University of California, Berkeley on December 7th. The meeting was hosted by Dr. Baldocchi (University of California, Berkeley), coordinator of the FLUXNET project. Dr. Gu of the same laboratory who is in charge of the data analysis of FLUXNET and thirty American scientists took part. There were eleven topics in the meeting, which were discussed one by one (free discussion). Although there were presentations under the Special Section of AGU (CO<sub>2</sub> Cycle and Continental Ecology), the layout of the presentations was as follows:

**1.Outline 1 of FLUXNET (Baldocchi):** Presentation of the present and past results of FLUXNET. The content can be found in detail in FLUXNET: A New Tool to

Study the Temporal and Spatial Variability of Ecosystem-Scale Carbon Dioxide, Water Vapor, and Energy Flux Densities, 2001, Bulletin of the American Meteorological Society, 82, 2515-2434'.

**2.Presentation of AsiaFlux (Saigusa):** The center of this presentation was the measurement results of high mountains and the study site at Tomakomai.

**3.Outline 2 of FLUXNET (Olson):** Mainly the introduction of the FLUXNET outline on the construction of a database.

**4.Outline of CarboEurope (Falge, Germany):** The outline of the project in Europe and the presentation of the results obtained so far.

**5.Results of the AmeriFlux (Law):** The presentation was centered on the measurement results of needleleaf coniferous trees in Oregon State.

**6.Introduction of OzFlux (Leuning):** Outline of the flux measurements and the imbalance of the Heat



Balance theory (change of the average time and coordinate axis). Within the presentation there was the suggestion about the need to carry out the monitoring of CO<sub>2</sub> monitoring in each site in order to analyze the imbalance model. In relation to this suggestion the need is understood. However, there were negative opinions about this because of the problems involved in the supply of the standard gas to measure the absolute value of the concentration with a good degree of accuracy.

**7.Importance of seasonal biology (Phenology) (Gu):** To NEE the direct effect of changes in temperature are not so significant, but the indirect effects through the changes in phenology are significant. The possibility of conducting the monitoring of the phenology (period of budding, shedding of leaves, flowering) in each site was also suggested. This suggestion did not receive active support as it is difficult to monitor phenology at each site.

**8.Flux measurements in the Amazon (Nobre):** Presentation of the Flux measurements in the Amazon Tropical Rain Forest.

**9.Presentation of LBA (Krujiti):** Presentation of Large

Scale biosphere-atmosphere experiment in Amazon (LBA) and the results obtained so far (The strong effect of rainfall in the NEE of the Amazon Tropical Forest).

**10.Spectrum solution of FLUXNET (Morgenstern, Canada):** Carrying out the spectrum solution of Turbulence using FLUXNET data. A report of the basic similarities in spectrum form in every site was presented.

**11.Flux measurements in New Zealand (Campbell):** Presentation of the flux measurements in wetlands in New Zealand (North Island).

Despite no agreement from this meeting, presentations and discussions were held in a very relaxed environment where there was an open exchange of a variety of information. A request was made by FLUXNET regarding the arrival of the data from AsiaFlux. Despite AsiaFlux lagging behind Europe and America it is important to obtain and publish data from the unique climate and land use found in this region. The goal of AsiaFlux is not only to replicate the FLUXNET sites already existing but to develop an original strategy.

## Report of the Inspection on Flux Measurement by Members of the Chinese Academy of Science

Susumu YAMAMOTO (National Institute of Advanced Industrial Science and Technology)

The Institute of Geographical Sciences and Natural Resources, Chinese Academy of Sciences, composed mainly by the Chinese ecosystem research network (CERN) has drawn up a 5 year plan of flux measurements in a land ecosystem. To carry it out, Dr. Chen Panquin (Bureau of Science and Technology for Resources and Environment, Chinese Academy of Sciences, vice-president of the leading committee of CERN) at the head of an 8 persons inspection party visited Japan from



the 18th to 25th of December 2001. The inspection party visited the National Institute of Advance Industrial Science and Technology; the National Institute for Environmental Studies and the Forestry and Forest Products Research Institute. They met Flux researchers from Japan and gave their opinion about the Cooperative Research with China, about flux measurement technology, and about the activities of AsiaFlux. This was conducted in a very friendly atmosphere.



Furthermore, in order to have a reference for the design of flux measurement sites in China as well as the equipment connections, the party visited the Flux Tower measurement site and inspected the measurement locations. The sites they visited were:

- 1.the Hokkaido Tomakomai Flux measurement site in which measurements by the National Institute for Environmental Studies and the National Institute of Advanced Industrial Science and Technology take place,
- 2.the Fuji Yoshida measurement site in Yamanashi Prefecture, where measurements by the Forestry and Forest Products Research Institute take place.

The head inspector observed that the results of the inspection will be very useful for the planning of the construction and equipment of three sites in the forest, two sites in tree plantations, two sites in farming areas and one site in grassland in China. Furthermore, there are plans for training programs on flux measurement technology and methods of analysis, but for this they requested the cooperation of researchers from Japan.

AsiaFlux aims from now on to cooperate on the success of flux measurements in China (Plan of CERN) and for obtaining a wide range of data in East Asia.

## Japanese-American International Comparison Measurements, August 2001

Yuichiro NAKAI (Forestry and Forest Products Research Institute)  
Nobuko SAIGUSA (National Institute of Advanced Industrial Science and Technology)  
Takashi HIRANO (Hokkaido University)

Efforts continue to assemble an international network to measure carbon dioxide and water vapor fluxes (absorption/emission) from forests. Strong cooperation between networks, and in particular the need for comparison of measurement methodologies and results, has become of crucial importance.

At present, American Flux Measurement Network, AmeriFlux, has become the standard for comparison of international CO<sub>2</sub>/Energy flux measurements from sites around the world.

As a part of this, AmeriFlux recommended a comparison of measurement methodologies with AsiaFlux. In August 2001, Dr. Bob Evans (USDA Forest Service) from AmeriFlux, a specialist on measurement comparisons, came to Japan to compare measurement methodologies in two forest locations.

The Institutions participating were the National Institute of Advanced Industrial Science and Technology (Deputy Director, Dr. Yamamoto and Senior Research Scientist, Dr. Saigusa); Graduate School of Agriculture Hokkaido University (Associate Professor, Dr. Hirano); Forestry and Forest Products



**Picture 1 Dr. Bob Evans at the top of the tower in the Flux Research Site in Tomakomai.**

Research Institute (Lab. Head, Mr. Ohtani); Hokkaido Branch of the Forestry and Forest Products Research Institute (Group Leader, Dr. Nakai and Researchers, Mr. Kitamura and Mr. Suzuki); National Institute for Environmental Studies (NIES fellow, Dr. Toriyama).

From August 10 to 16 measurement comparisons took place in the Tomakomai Flux Research Site (National Institute for Environmental Studies, Center for Global Environmental Research) in the city of Tomakomai Hokkaido. From August 16 to 20, the measurement



**Picture 2 The AmeriFlux measurement comparison instruments brought by Dr. Evans.**

comparisons took place in the Sapporo Forest Meteorology Research site of the Forestry and Forest Products Research Institute Research center Flux Network.

The eddy correlation method and the band pass covariance method were used to measure fluxes; in each of the sites measurements comparisons were conducted for the Ultrasonic anemometer, Close-Path Type Infrared Gas analyzer (LI-COR, LI6262); Open Path Infrared Gas Analyzer (LI-COR, LI7500, Only in Tomakomai); HMP/Vaisala thermo-hygrometer, net radiometer, photosynthetically active radiometer, CO<sub>2</sub>/H<sub>2</sub>O/Sensible Heat Fluxes.

During the measurement period, good weather conditions permitted plentiful data to be collected for comparison. Moreover, this provided a good opportunity for exchanging important information and for inspecting the accuracy of instruments and measurement techniques of each of the participating groups.

Almost all the comparative methods proved to be satisfactory, and at present a detail analysis and discussion of the results is expected to improve flux measurement methodologies and calculation methods.



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### AsiaFlux Logo

Here is a draft of AsiaFlux Logo, which we are hoping to use in the AsiaFlux Newsletter from the No.2 issue. The AsiaFlux Secretariat will be happy to receive your opinions on this logo or your ideas on the alternative designs.



From the Secretariat

Readers are welcome to respond to the AsiaFlux Newsletter.

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