June 2004
Issue No.10

AsiaFlux Newsletter

Contents

- Fostering Research on the Carbon-Climate-Human System
- Report on "Beginning of Long-Term Ecological Research in Japan"
- The International Conference on the Boreal Forest and Information on the AmeriFlux Sites in the West Coast
- Flux Observation at Kiryu Experimental Watershed
- Announcement of the APGC-Post Flux Meeting on Oct. 22-23, 2004, Tsukuba

Fostering Research on the Carbon-Climate-Human System

Penelope CANAN
Global Carbon Project, Tsukuba International Office, Japan

The Global Carbon Project (GCP) opened its second International Project Office on April 22, 2004, at Japan's National Institute for Environmental Studies. Promoted under the Earth System Science Partnership (ESS-P), the GCP Tsukuba Office joins the GCP office in Canberra, Australia, located at the Earth Observation Center. http://www.globalcarbonproject.org/

World leaders of four science communities—the International Geosphere-Biosphere Programme, the International Human Dimensions Program, the World Climate Research Programme, and Diversitas-created the ESS-Partnership. Based on their "Amsterdam Declaration," announced in 2001 at the Global Change Open Science Conference, they initiated a project to foster scientific collaboration on the carbon-climate-human system as a system of complex components—the Earth System. As scientists they urged governments, public and private institutions, and people of the world to cease "business-as-usual" behaviors that, scientifically speaking, are simply not sustainable on this planet. They emphasized the need to see the Earth as a self-regulating system composed of physical, chemical, biological, and human components. They also called for a reorganization of science to promote collaboration appropriate for understanding the Earth System.

The purpose of GCP is to develop comprehensive, policy-relevant understanding of the global carbon cycle, encompassing its natural and human dimensions and their interactions with climate. To realize its purpose, the GCP is dedicated to fostering collaboration and integration across disciplines of natural and social sciences and across national and institutional boundaries. This image of the way science must work is a dramatic departure from the past (*reductionism*) and presents an exciting challenge for us who want to bridge the barriers among the sciences through a *systems approach*, and to make our work policy relevant (*understandable, timely, in the hands of the right people*).

The importance of understanding the interaction between human societies and the non-human compo-

nents of this planet has become paramount. This is so because human practices since the Industrial Revolution (for example, fossil fuel burning, land use changes, and urbanization) have had such a large impact on the planet that the Earth has moved well outside the range of the natural variability exhibited over the last half million years at least. In other words, patterns of social behavior have brought the Earth to an operating state for which we have no historical comparison. We do know that this unprecedented planetary condition is not sustainable.

Activities of the GCP are organized around three main themes: (1) patterns and variability; (2) processes and interactions; and, (3) carbon management. Our current priority areas are coordination and standardization of measurements from different platforms on land, air, and ocean for carbon-climate research; integration of carbon management into community development plans and programs; international comparisons of biogeochemical models and model-data validation exercises; and developing carbon mitigation and adaptation options under an umbrella of regional sustainable development.

Ribbon-cutting ceremony opens Global Carbon Project at NIES on Earth Day.
Gen INOUE, Penelope CANAN, Berrien MOORE III cut the ribbon.

The Tsukuba office is particularly focused on fostering the scientific understanding of the "human dimensions" of the carbon cycle and the challenge of linking such understanding to science on the other components of the Earth System. The human dimensions include patterns and processes concerning demography, social (in) equality, technology, social institutions, and culture as they are interrelated and related to the carbon cycle and climate. Social institutions refer to the clusters of norms and values that have crystallized into recognizable large-scale social patterns such as the family, religion, the polity, the economy, and science.

The GCP Tsukuba office plans to embark on a variety of avenues of inquiry and action to move the understanding of the human dimensions of the carbon cycle forward. The activity plans are expected to become official after they have been discussed with the Scientific Steering Committee at a meeting planned for July 2004 in Goa, India.

One of the first projects planned is a comparison of the specification of variables and linkages in a number of "coupled models." Secondly, we anticipate fostering a project-based approach to carbon emission reduction and sequestration as an opportunity for regional development. We think that real projects will help us identify the different policy-relevant expert perspectives and offer a focus for "outcome-based" collaboration. For that reason we are hoping that Yamagata Prefecture and US state of Colorado (already "sisters") will work together to test an integrated carbon management approach that we want to develop along with colleagues within NIES, in Yamagata, and Colorado.

Another activity planned for the GCP Tsukuba office is our Science and the Media Network project to link scientists and journalists in partnerships designed to improve the communication between them. We look forward to working with such organizations as Japan's Global Environmental Forum, the Japan Environmental Journalists Association, the National Association of Science Writers in the US, the Asia-Pacific Network, the New York Times and the Keystone Center for Science and Policy to advance the level of understanding for citizens of the pressing challenges surrounding global warming, climate change, lifestyle choices, and the political economy.

We hope to stimulate the amount, quality, and exchange of research being conducted within the social

sciences, policy studies, and the humanities so that more people are considering the carbon cycle and climate change in their thinking. That means that we will tap existing research and policy networks to invite greater participation in deriving policy relevant carbon cycle science, beginning with the active intellectual community in Tsukuba Science City. One part of this outreach and training effort is the GCP Seminar Series on Human Dimensions of the Carbon Cycle that began at NIES in June. Series topics include Fostering Expert Networks to Integrate Science and Policy; Urbanization and the Carbon Cycle, Economic Models of Climate Change; The Family of Climate Models called the Asia-Pacific Integrated Model (AIM); Fundamentals of Social Impact Assessment and Management; A Report from the Post Kyoto Symposium; Regionalism and Carbon Management; The Media and Community-Based Research; and, A Comparison of Models of the Human Dimensions of the Carbon Cycle.

We will also conduct a number of didactic seminars/workshops aimed at professional associations. We will begin this effort to inspire social science research on the carbon cycle at the annual meeting of the American Sociological Association in Philadelphia, Pennsylvania (USA) in August 2005.

The Executive Director of the GCP-Tsukuba office is Dr. Penelope CANAN, a sociology professor from the University of Denver in Colorado (USA). Melanie HARTMAN (USA) is senior researcher, Harumi KATO (JAPAN) is special assignment researcher, and Yukako OJIMA (JAPAN) is secretary. The office at NIES can be reached at Tel.:81-29-850-2672 or by email, <penelope.canan@nies.go.jp>.

The Scientific Steering Committee is comprised of scientific leaders from around the world and across disciplines. The nations represented on the committee include Australia, Canada, France, Germany, India, Italy, Japan, Mexico, China-Taipei, Thailand, the United Kingdom, and the United States. Dr. Yoshiki YAMAGATA of the Climate Change Research Project (NIES) is a member of the Science Steering Committee.

Report on "Beginning of Long-Term Ecological Research in Japan"

Hideaki SHIBATA

Hokkaido University, Japan

The scientific session entitled, "Beginning of Long-Term Ecological Research (LTER) in Japan" was held as a part of the 115th annual congress of Japanese Forestry Society at the University of Tokyo on April 2, 2004. Fifteen oral presentations reported the current status, problems and future scope and directions for the progress of LTER activities in Japan based on their own scientific backgrounds. Several hundreds of audiences attended the session, indicating that the communities of forestry society in Japan have a strong interest in LTER. "LTER" is an important strategy to investigate ecological phenomenon with large temporal and spatial variation. US-LTER (http://lternet.edu/) and ILTER (International LTER, http://lternet.edu/) have been already established and are widely contributing to the progress of ecological studies. At present, Japan is not an official member of ILTER (Figure 1).

Kohsuke HOMMA (Niigata University) reported the current status of Japan LTER (JaLTER) as his opening remark entitled, 'Constructing Long-Term Ecological Research system in Japan.' He introduced that related scientists who had the motivation to establish LTER in Japan recently organized the network of the related scientists (JERN; Japanese Ecosystem Research Network, http://www.jern.info/) associated with JaLTER. Yoshinobu SATO (Kyushu Univ.) reported that some members of JERN attended the 2003 LTER held in Seattle (http://lternet.edu/asm/2003/), and visited some US-LTER and later visited Chinese LTER sites (http://www.cern.ac.cn/) to learn the current activities in each site.

1. Current status of long-term ecological research in University's forests

There were several presentations revealing that current related programs in University's experimental forests, suggesting that those forests have a large potential to be utilized as core-sites of LTER in Japan. These series of presentations from different University's experimental forests also indicated that there are large climatic and environmental gradient in Japanese archipelago, implying the cross-site comparison will be interesting direction for JaLTER. Hideaki SHIBATA (Hokkaido Univ.) emphasized that tight collaboration with scientists and technical staffs in experimental forest is important for the long-term monitoring of biogeochemistry, hydrology and forest dynamics. Web-based database for forest research (http://pc3.nrs-unet.ocn.ne.jp:8080/default.htm) and GIS analysis for forest management have been recently established in Hokkaido University forests. Hirofumi SHIBANO (The Univ. of Tokyo) reported long-term observation of stream discharge in forest stream from 1924 in Aichi experimental forest of the University of Tokyo. These dataset are one of the longest records of forest hydrology in Japan. He also presented the long-term vegetation change during the past 50 years associated with the temporal change of the hydrological phenomena. Tsutomu ENOKI (Ryukyu Univ.) presented unique characteristics of Ryukyu University' forest frequently affected by typhoon disturbance in Okinawa Island, and introduced the related current ecological research in long-term plots. Intensive research on biodiversity entitled 'IBOY (International Biodiversity Observation Year)' has been also conduct-

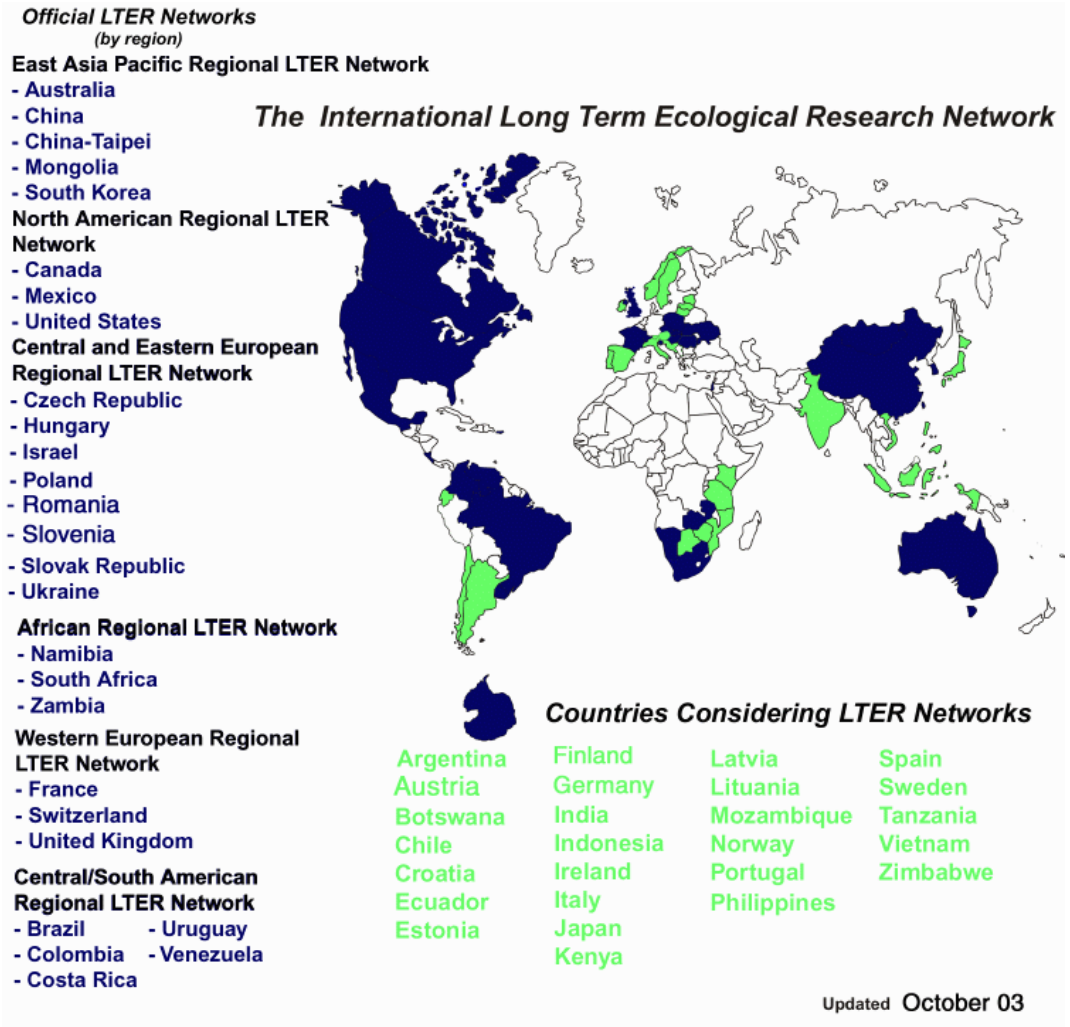


Fig.1 International Long Term Ecological Research Network (http://www.ilternet.edu/networks/)

ed in Yona experimental forest of Ryukyu University. Kyoichi OHTSUKI (Kyushu Univ.) introduced the current research program relating hydrology and meteorology in some forested catchments in Kyushu University's experimental forest. Akio FUJIWARA (The Univ. of Tokyo) suggested the importance to analyze the sounds and image in forest for the assessment of ecosystem function based on his different scientific aspects from the current ecological studies.

2. Frontier of long-term and/or large-scale analysis of ecological research

The ongoing nation-wide comparative study of climate at Japanese university's experimental forests was reported by Masahiro TAKAGI (Miyazaki Univ.), principal investigator of the project. This project will develop new web-based database of climate in forest region in the several sites from north to south in Japanese archipelago within a couple of years. Eiichi KONOHIRA (Nagoya Univ.) presented his intensive measurements of forest stream chemistry over 1,000 sites in almost all prefectures in Japan, suggesting the significant pollution of stream water due to atmospheric deposition was observed near urban area. He also addressed the importance of the combination of long-term observation and the snap-shot regional survey to understand the ecosystem function and mechanisms.

Advantages of the remote-sensing using satellite and aerial photo image analysis and aerial radar analysis to investigate large-scale temporal change of biodiversity, vegetation composition, carbon sequestration of forest and land-use were presented by Tatsuo SWEDA (Ehime Univ.) and Gen TAKAO (FFPRI; Forestry and Forest Product Research Institute), respectively.

3. Long-term research on vegetation dynamics

Several presentations focused on the long-term monitoring of forest vegetation change in experimental plots in various regions in Japan. Takayuki KANEKO (Kyoto Univ.) introduced the long-term research of forest vegetation growth and composition in large experimental plot (16 ha) in Ashu experimental forest, Kyoto University. Satoshi SAITO (FFPRI) and Satoshi ISHIBASHI (FFPRI) reported the current status of long-term ecological plot for vegetation dynamics operated by FFPRI. They suggested the clear direction, strong leadership and continuous motivation in each organization are very important to continue the long-term research based on their past experiences. Kaoru NIIYAMA (FFPRI) presented the Forest Dynamics Database (http://fddb.ffpri-108.affrc.go.jp/en/index.html) recently established by FFPRI. He explained the policy of database management, data sharing and general construction of the database, and emphasized the importance of well-organized database development for LTER program for not only current studies but also for the future related studies and educations.

4. Future direction and conclusion

In general discussion with the audience in the session, the current problems of database development (awareness of data sharing, data authorities and so on) and importance of QA/AC (quality assurance and quality check) analysis of chemical analysis for LTER were discussed from the various aspects. Some discussions revealed the difficulty of long-term measurement with same methodology when a new technique was developed. One of the audience pointed out that each site should more appeal their possibilities and potential as a LTER site and should develop innovative large project using LTER approach to promote the related scientific communities and governments.

In September 2004, Asia-Pacific regional LTER meeting will be held in Beijing, China. Some members of JERN will attend the meeting and report the progress of JaLTER. I believe this reported session and the related current efforts will significantly contribute to our science associated with ecological study.

Acknowledgments: Current activity of JERN (Japan Ecosystem Research Network) was partly funded by Japanese Society for the Promotion of Science (No. 15631001).

The International Conference on the Boreal Forest and Information on the AmeriFlux Sites in the West Coast

Naishen LIANG
National Institute for Environmental Studies, Japan

Summary of the international conference on "Climate Disturbance Interactions in Boreal Forest Ecosystems"

Following the tropical forest, the boreal forest is the world's second largest forested biome occupying the circumpolar region in the uppermost Northern Hemisphere; North America, Europe, and Asia. This heterogeneous biome stores about 25% of all terrestrial carbon, and the dominant plants consist of a very few species found in four main genera - the evergreen spruce (*Picea*), fir (*Abies*), pine (*Pinus*), and the deciduous larch (*Larix*). During the last decades, however, the structure and functioning of the boreal forest have been seriously influenced by the disturbances from fire, insect outbreaks, timber harvest, and flooding. The extent and distribution of these disturbances are changing rapidly due to global warming, human population grows, and socioeconomic condition change. For helping us to understand the current and future structure, diversity, and functioning of the boreal forest, the committee of the International Boreal Forest Research Association (IBFRA) organized an international science conference on "Climate Disturbance Interactions in Boreal Forest Ecosystems" on May 3-6, 2004 in Fairbanks, Alaska (http://www.lter.uaf.edu/IBFRA/default.cfm). About 180 scientists from North America, Europe, and Asia gathered at the conference, and the lecture theatre was full of every session over the four conference days.

Fire is the most important disturbance for the boreal forest. M.D. FLANNIGAN reviewed that an average of 5-15 million hectares burn annually in boreal forests, primarily in Siberia, Canada and Alaska. Fire activity is strongly influenced by four factors - weather/climate, fuels, ignition agents and humans. However, the boreal forest authority F. Stewart CHAPIN III temporally and spatially scaled that human activities account for only a small proportion of the area burned (11%) at the scale of interior Alaska. For some boreal forest in Russia and the northern Europe, Maureen V. DUANE and Anatoly SHVIDENKO pointed that clearcut harvest is the most common type of disturbance in these regions. In Canada boreal forest, in addition to wildfire, Werner A. KURZ showed that periodic insect epidemics are the primary natural disturbance.

Soil of boreal ecosystems store an essential part of the total terrestrial carbon pool. However, because of the low temperatures, decomposition is fairly slow, and soil microorganism activity is limited. Permafrost distribution (Heiner ŒLESSA) and fire and stand types (David PARE) may play key roles in the soil carbon cycling by significantly affecting the soil temperature. Furthermore, Achim GRELLE presented climatic extremes such as cold winters with extraordinarily deep soil frost penetration can have significant effects on annual net ecosystem exchange (NEE).

As one of the colleagues from the Asia, Naishen LIANG impressed on the conference attendances with the presentation of multichannel automated chamber systems for continuous measurements of carbon flux components of forest ecosystem.

Application of multichannel automated chambers in Alaska boreal forest

After the conference, I took a couple of days to install a multichannel automated chamber system to measure soil CO_2 efflux in Alaska boreal forest (Photo. 1). The system is a modified one from that described by LIANG et al. (2003, Tree Physiology 23; 2003, AsiaFlux Newsletter-http://www-cger2.nies.go.jp/asiaflux/nl/2003/no07e_2003.pdf; 2004, Agricultural and Forest Meteorology 123). In brief, the automated chamber system has a non-steady-state, flow-through design. The

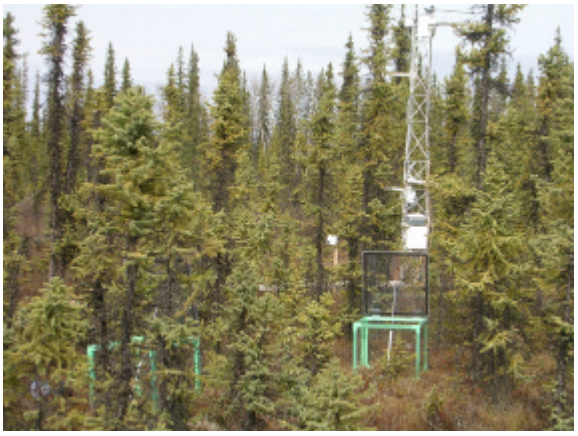


Photo. 1 Automated soil CO_2 efflux chambers at the CO_2 flux site of the University of Alaska Fairbanks (UAF).

system comprises 8 automated chambers and a field access case. The chamber size is 0.6 x 0.6 x 0.5 m (L x W x H). The field access case (0.7 x 0.5 x 0.35; L x W x H) includes an 8-channel gas sampler, a CO_2 analyzer (LI-820), a datalogger (CR10X), and a compressor system. Over the course of a half hour, the 8 chambers are closed in sequence by the 8-channel gas sampler programmed by the CR10X. We set the sampling period for each chamber to 225 s. The CR10X acquires output from the LI-820 at 1-s intervals and averaged and recorded it every 10 s. The whole system has a mean power consumption of < 15 W. Therefore, a combination of three 75 W solar panels and three 150 Ah true deep cycle marine batteries has been found sufficient to power the system at study sites without electricity. Currently, we are utilizing the similar systems to gather soil CO_2 effluxes automatically at several sites, from the tropical rainforest in Malaysia, tropical seasonal forest in Thailand, temperate deciduous broadleaf forest in Korea, coniferous forests in Japan, tundra in Siberia, and boreal forest in Alaska, within the AsiaFlux network.

AmeriFlux sites in the west coast

I was very glad that I had a chance to visit the two AmeriFlux sites in the west coast - Wind River Canopy Crane Site in the south of Washington State and Metolius Site in the center of Oregon State. The Wind River Canopy Crane was erected in 1995 by the University of Washington, in cooperation with the USDA Forest Service and Pacific Northwest Research Station (http://depts.washington.edu/wrccrf/). Ken BIBLE and Matt SCHROEDER introduced me most of the facilities and researches undergoing at the site. Wind River has the most comprehensive information on carbon flux in west North American forests of any site. The crane facility has the advantages of tower, at least partially because the crane with a high jib (75 m) and long arm (85 m) can gain access to 320 canopy trees in the 2.3 ha perimeter. Moreover, I was impressed with the soil moisture profile sensors installed at the site (Photo. 2), the same instrumentation was also found at Metolius site. The sensors (EnviroSmart™, Sentek Pty Ltd, Australia) utilize electrical capacitance to measure moistures through the soil profiles. A high frequency electrical field, created around each sensor, extends through the plastic access tube into the soil, to provide an extremely accurate soil moisture measurement. However, this facility has not yet employed at any of the AsiaFlux sites.

James IRVINE guided me to the three flux sites in the

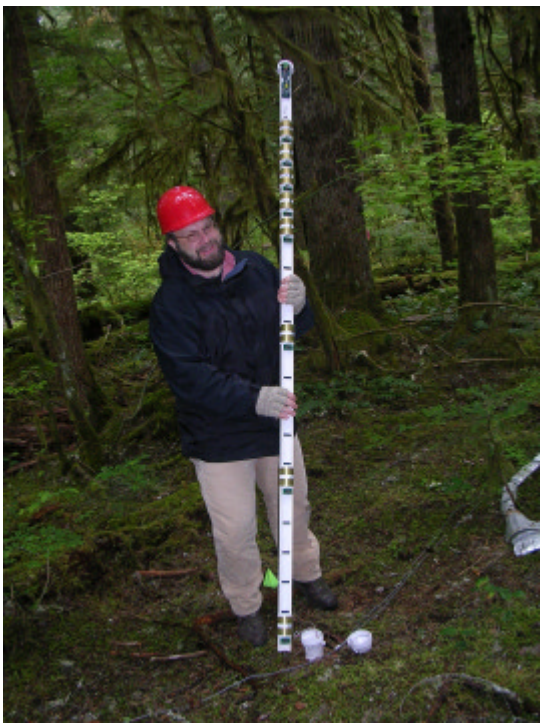


Photo. 2 Ken BIBLE is introducing the soil moisture sensors.

Metolius River basin that belongs to Beverly LAW's research team (Department of Forest Science, Oregon State University). He has maintained, installed, and practically built most of the equipment and instruments used to maintain the flux sites, including the automated chambers for measuring soil CO_2 eflux (Photo. 3). They focus on the effects of disturbance on processes controlling carbon storage, fluxes, and energy exchange with the atmosphere in relation to climate and disturbance in chronosequences of ponderosa pine. They are currently making eddy covariance and biological measurements and model parameter measurements necessary to develop carbon budgets (e.g. soil CO_2 eflux, foliage respiration, litterfall, annual productivity, LAI, foliar and soil chemistry) at the mature (90 yrs) and young (20 yrs) pine flux sites. They have built and installed an automated soil chamber system at each site, so that they have continuous soil CO_2 eflux measurements.

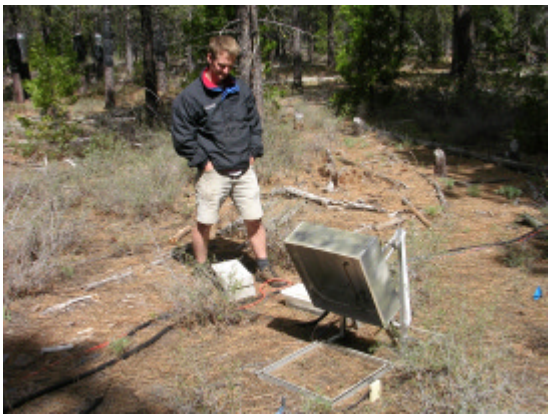


Photo. 3 Automated soil CO_2 efflux chamber designed by James IRVINE.

Flux Observation at Kiryu Experimental Watershed

Yoshiko KOSUGI
Kyoto University, Japan

The Kiryu Experimental Watershed (KEW) is located at 34°58'N, 136°00'E in Shiga Prefecture, Central Japan. Around this area, there used to be beautiful forests of Japanese Cypress covering the Tanakami Mountains. They were devastated about 1200 years ago because of fire and the excess use of timber to build Nara and Kyoto city (old capitals of Japan). The denuded situation continued for a long period. The forestation on the hillside has been carried out over the last 100 years for preventing soil erosion and for timber industry. Consequently, most of this area was covered with the plantation forests.

The watershed covers 5.99 ha and ranges in elevation from 190 to 255 m. A meteorological observation tower is located in a small catchment within the experimental watershed; this small catchment has an area of 0.68 ha and is mainly covered by *Chamaecyparis obtuse* Sieb. et Zucc. (Japanese cypress, an evergreen conifer) planted in 1959. *Pinus densiflora* Sieb. et Zucc. and several deciduous broad-leaved tree species are sparsely present. In recent years, pine-wilt disease has decreased *P. densiflora* stands. *Eurya japonica* Thunb. dominates the forest floor. The total leaf area index (LAI), measured using an LAI-2000 plant canopy analyzer (Licor, Inc., USA), ranges approximately from 4.5 to 5.5 with a little seasonal fluctuation. The entire catchment consists of weathered granite with abundant amounts of albite. The topographic map of the area shows a mild northward inclination of approximately 9.2 degrees. Winds flow mainly from the north during the day and from the south at night. The annual mean air temperature from 1997 to 2001 was 14.0° C, and annual mean precipitation from 1972 to 2001 was 1645.0 mm. The site therefore has a warm temperate climate. Rainfall occurs throughout the year, peaking in summer. Little snow falls in winter.

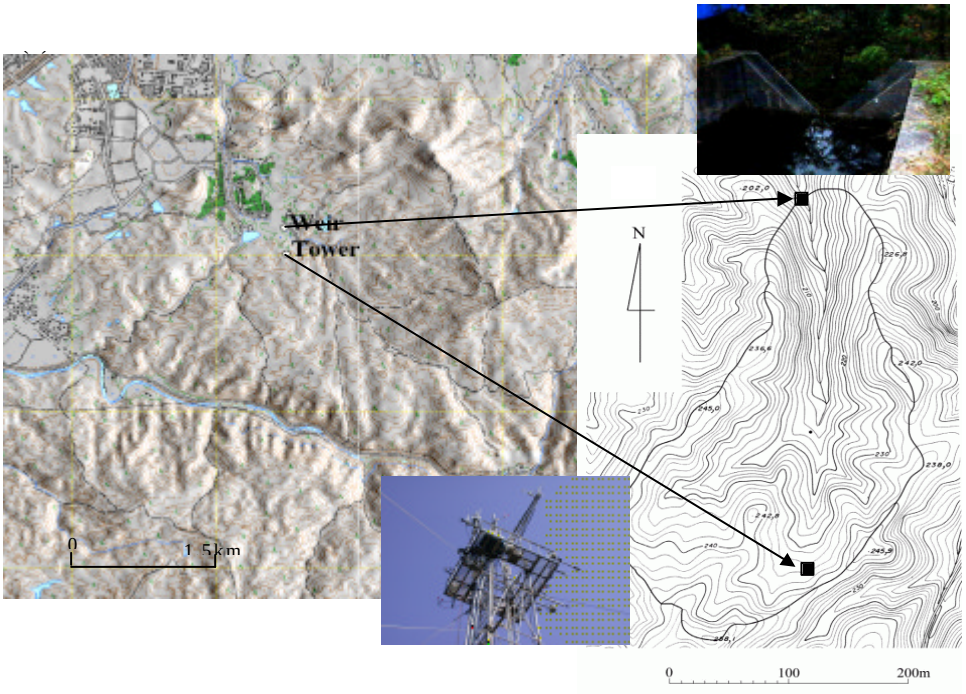
KEW was originally established in 1967 to elucidate hydrological water circulations and relating role of forest, trees, and soil. KEW has one of the longest historical hydrological databases and continuous research programs in Japan. Our research activity in this watershed aims not only estimating gas exchange between forest and the atmosphere, but also quantification of water, energy, and chemical compounds budgets in forest catchment, quantification of carbon dynamics in soil,

plant and air continuum, and understanding of hydrological regimes.

Pioneer flux observation with eddy covariance method at KEW began in 1990. Recently fluxes of momentum, sensible heat, water vapor, and CO_2 were measured by eddy covariance methods at tower heights of 29.0 m. A three-dimensional sonic anemo-thermometer (model DAT-310 or DA-600T [since 27 December 2001], KAIJO, Japan) measured air temperatures and three-dimensional wind speeds. A fast-response, closed-path infrared gas analyzer (IRGA; model LI-6262 or LI-7000 [since 9 August 2001], LI-COR Inc.) measured water vapor and carbon dioxide concentrations. Gas concentrations were also measured by an open-path IRGA (model LI-7500, LI-COR Inc.) starting on 30 April 2002. Micrometeorological components above and within the canopy, including the vertical distribution of wind velocity, CO_2, PAR, air temperature, humidity, and leaf wetness, are also monitored. The storage fluctuations of sensible heat, latent heat and CO_2 in the air below the reference height and the storage fluctuation of heat in the stem are estimated using these data.

We also conduct the detailed measurements of individual processes within the forest, which determine the fluxes over the canopy. Spatial and temporal distribution of the leaf gas exchange characteristics is measured with the LI-6400 portable photosynthesis system, accompanying with carbon isotopic and chlorophyll fluorescence analysis. Spatial and temporal distribution of the soil respiration is measured by the chamber method. Automated soil, stem and leaf chambers are monitoring the temporal fluctuation of respiration rate of each component.

A multi-layer model for CO_2 and H_2O exchange in a C3 plant community is parameterized based on these intensive observations and used for the analysis to understand the energy/H_2O/CO_2 dynamics within and above forest canopy. This multi-layer model can produce above-canopy fluxes based on detailed processes characterized by the canopy structure and the biochemical processes, supporting our data analyses of NEE.



Kiryu Experimental Watershed

Announcement of the APGC-Post Flux Meeting on Oct. 22-23, 2004, Tsukuba

An APGC-Post Flux Meeting will be convened after the symposium of "The 6th International Symposium on Plant Responses to Air Pollution and Global Changes" to be held on Oct. 20-22, 2004 at the Tsukuba Center for Institutes, Tsukuba (http://apgc2004.en.a.u-tokyo.ac.jp/). We hope the APGC-Post Flux Meeting will give you an opportunity to discuss the current research results, to foster cooperation and to exchange ideas.

For more details, please contact us by e-mail. <asiaflux@nies.go.jp>

Venue
Conference Room, Climate Change Research Hall
National Institute for Environmental Studies (NIES)
16-2 Onogawa, Tsukuba, Ibaraki 305-8506, Japan

Schedule

Oct. 22 (Fri.)	15:00 -	Registration
	16:30 -	Welcome and introduction
	17:30 - 20:00	Poster session (light meal)
Oct. 23 (Sat.)	9:00 - 13:00	Seminar

Registration fees
Free. But charge 2,000 yen for light meal at the poster session

Organized by
Center for Global Environmental Research /
National Institute for Environmental Studies

Jointly organized by
AsiaFlux Network

Editor's Note

I hope that we will get profound results from the investigation of the unveiled nature by studying how the various processes in the forest determine the fluxes at the canopy.

The editor of AsiaFlux Newsletter No.10:
Yoshiko KOSUGI
(Kyoto University)

The editor of AsiaFlux Newsletter No.11 will be Tetsuya HIYAMA (Nagoya University).

AsiaFlux Newsletter
June 2004, Issue No.10

Editorial board:
Gen INOUE (Secretary-General)
Yasumi FUJINUMA, Koh INUKAI,
Yoko ARIHARA

c/o Center for Global Environmental Research
National Institute for Environmental Studies
16-2 Onogawa, Tsukuba, Ibaraki 305-8506 Japan
TEL: +81-29-850-2348,
FAX: +81-29-858-2645
E-mail: asiaflux@nies.go.jp

AsiaFlux Newsleter is only available on the AsiaFlux website at: http://www-cger2.nies.go.jp/asiaflux/