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AsiaFlux Newsletter

Contents

APAN 2003 Fukuoka Meetings for Future AsiaFlux-DIS

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APAN 2003 Fukuoka Meetings were held at SRP Center in Fukuoka, Japan, cooperated with the 3rd PRAGMA Workshop during January 20-25, 2003.

APAN: Asia Pacific Advanced Network

The necessity for high-end Internet for researchers in Asia Pacific region was recognized at APEC Symposium in Tsukuba, Japan in March 1996, and then Asia Pacific Advanced Network (APAN) was proposed at APII Test-bed Forum in Seoul, Korea in June 1996. Energetic meetings were held with the attendance of the delegates from North America or Europe for one year, and APAN Consortium was formed under a Memorandum of Understanding in June 1997 to promote advanced research in networking technologies and the development of high-performance broadband applications.

APAN is a non-profit international consortium. APAN is intended to be a high-performance network for research and development on advanced applications and services. APAN provides advanced networking environment for research and education in Asia-Pacific community. In order to lead the state of the Asia-Pacific research community, APAN is expanding and promoting the collaborative researches with worldwide renowned research institutes.

Organization

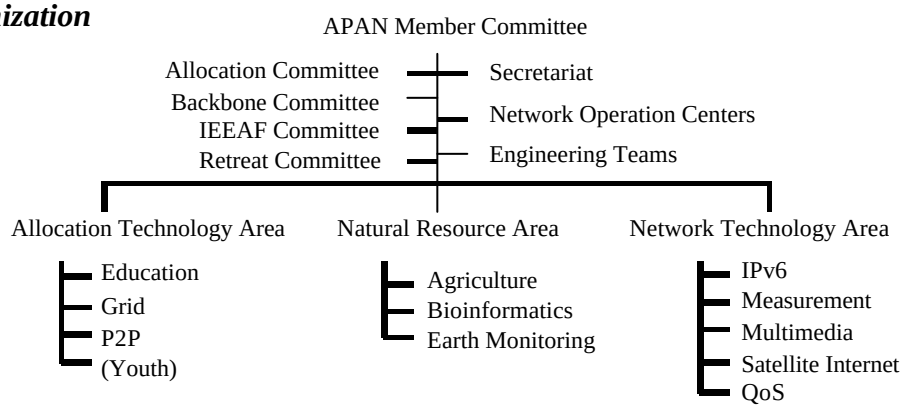

Fig.1 Organization of Asia Pacific Advanced Network Consortium

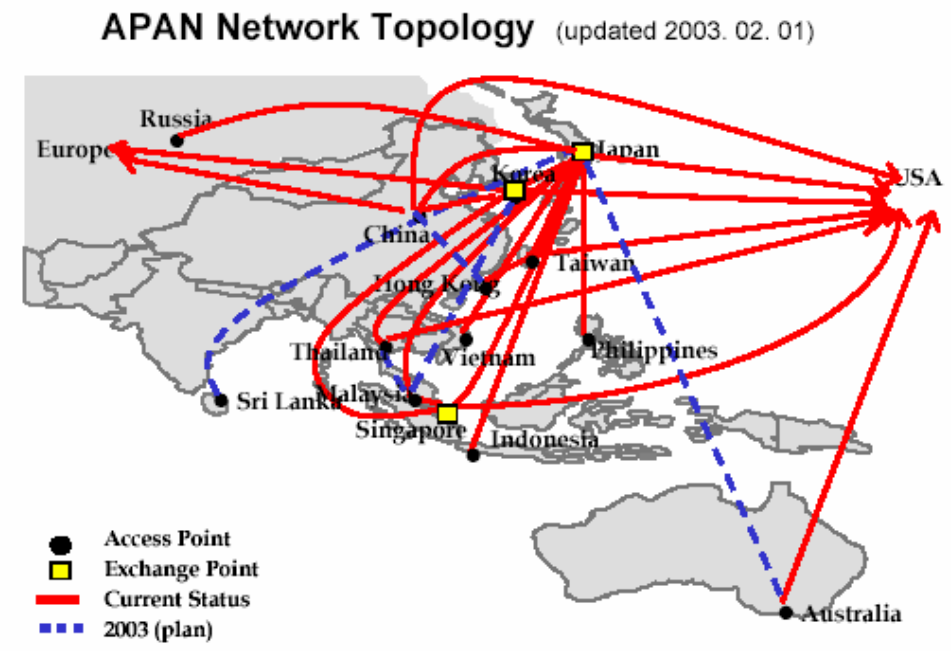

Fig.2 Network Topology of Asia Pacific Advanced Network

Photo 1 Local Organization Committee of APAN/PRAGMA 2003 Fukuoka Meetings

Photo 2
Left: Prof.Chon, president of APAN
Right: Prof. Arzberger, president of PRAGMA

GRID : next generation Internet

Grid is a new Information Technology (IT) concept of "super Internet" for high-performance computing: worldwide collections of high-end resources - such as supercomputers, storage, advanced instruments and immerse environments. The Grid is expected to bring together geographically and organizationally dispersed computational resources, such as CPUs, storage systems, communication systems, real-time data sources and instruments, and human collaborators. The term "the Grid" was coined in the mid1990s to denote a proposed distributed computing infrastructure for advanced science and engineering.

The term computational Grids refers to infrastructures aimed at allowing users to access and/or aggregate potentially large numbers of powerful and sophisticated resources. More formally, Grids are defined as infrastructure allowing flexible, secure, and coordinated resource sharing among dynamic collections of individuals, institutions and resources referred to as virtual Organizations.

The 3rd PRAGMA Workshop was organized by AIST, Osaka University, and Monash University. Satoshi Sekiguchi of AIST and David Abramson of Monash University were the co-chairs of the workshop.

PRAGMA (Pacific Rim Applications and Grid Middleware Assembly) has been founded as an open organization in which Pacific Rim institutions will collaborate more formally to develop grid-enabled applications and will deploy the needed infrastructure throughout the Pacific Region to allow data, computing, and other resource sharing. PRAGMA provides an opportunity for member institutions to work together to address applications and infrastructure research of common interest.

AsiaFlux-DIS : AsiaFlux Data and Information System

During the session entitled as "Asian dust and Weather data sharing" (chaired by me) and "Agriculture" Working Group meeting of Natural Resource Area (directed by Dr. Ninomiya, NARC, Japan), AsiaFlux was introduced as a potential customer of APAN with GRID concepts. Energy and CO_2 flux data from terrestrial ecosystems are expected to be huge in their volume. Furthermore, it needs semi-real time access to remotely located observation sites in order to archive raw data for diverse corrections in an appropriate time and to share them for numerical model validation and operation of such models as LSM, GCM and RCM through land data assimilation schemes (LDAS).

The model outputs also should be communicated through high performance network for further analysis like super-ensemble technology within time limits. In this regard, any NWPM requires high performance computers, networks, storages as much as available to meet various requirements by end-users from diverse disciplines, which will never easily be satisfied even in the developed countries. GRID technology will be surely a promising solution to overcome these barriers through high performance computing power on advanced network with appropriate storages that can meet any demands expected by sharing all available resources in dispersed network systems.

APAN with GRID technology, therefore, can be a promising network frame for flux data sharing by providing high performance next generation network and internet technologies like data GRID. In addition, it will also provide a bridge to computational GRID to facilitate supercomputing power that is prerequisite for the development of high-resolution numerical weather prediction models or very complicated coupled models. In addition, APAN will be able to provide AccessGRID, another grid technology for communication between

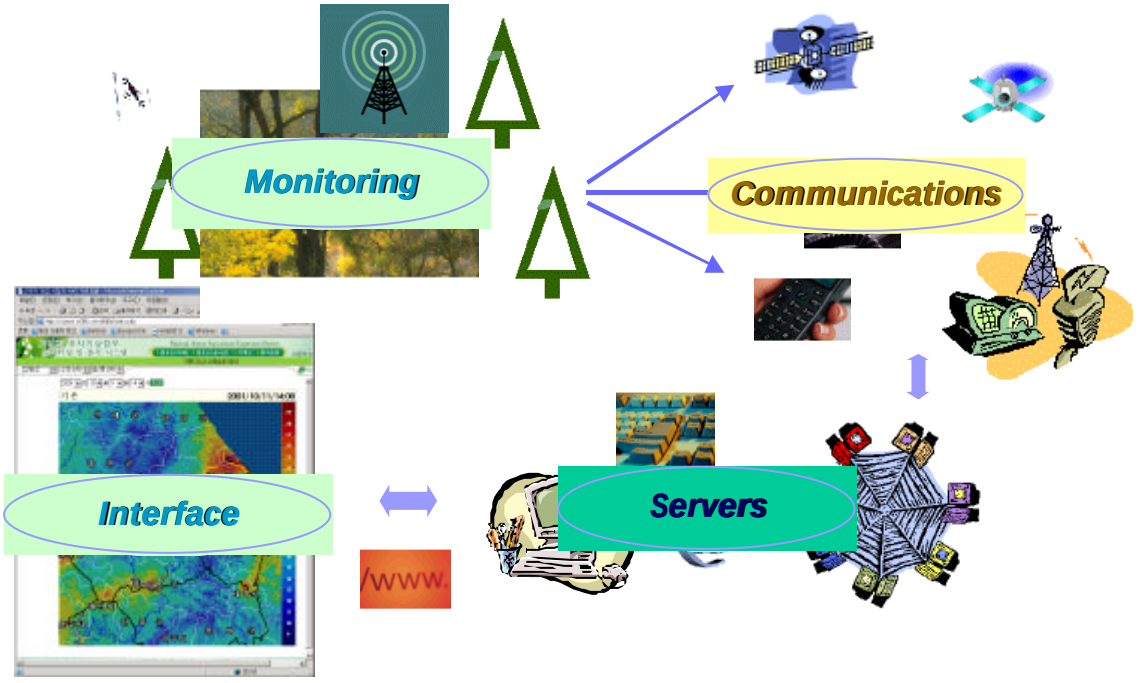

Fig.3 A typical architecture of flux data and information system in KoFlux

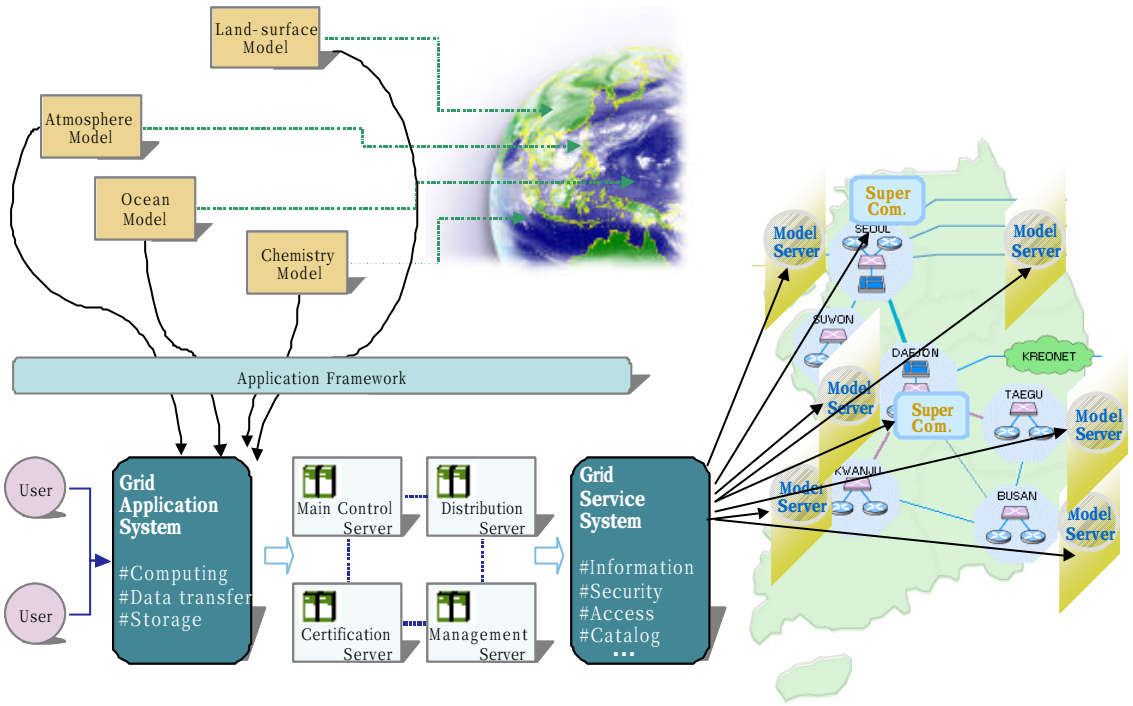

Fig.4 Schematic diagram of future GRID-based meteorological information network systems in Korea

peoples and resources, for video-conference, distance learning, cyber education/training, etc. It will also enable us to access AmeriFlux and EuroFlux via inter-continental network backbone such as TRANSPAC and TEIN, respectively. Recently Korea-Japan opened a new Giga bit network between Busan and Fukuoka through Genkai/Hyeonhae project. APAN-Fukuoka 2003 Meetings will be followed by Busan APAN Meetings this August to celebrate this historical high performance network between two countries. Surely GRID-based AsiaFlux-DIS will give us great benefits not only by efficient sharing of flux data themselves, but also by providing supercomputing powers that we always feel a critical limiting factor in our efforts to develop better numerical simulation models like land surface models with CO_2 metabolism. I believe that APAN with GRID technology will pave our way to the establishment of CARBO-Asia in this region together with our efforts with AsiaFlux, which will in turn lead us to our better understanding on this mother Earth through close regional collaborations.

KoFlux Domestic Workshop at Yonsei University, Seoul, Korea (Feb. 27, 2003)

Joon KIM
(Yonsei University, Korea)

It has been more than a year now since KoFlux has been launched during the Second AsiaFlux International Workshop held in Jeju Island, Korea in January 2002. About 40 scientists gathered together on 27 February 2003 for KoFlux Domestic Workshop at Yonsei University in Seoul, Korea. In the beginning KoFlux established four tower flux sites in a deciduous forest, coniferous site, urban and rural rice paddies. It has grown to an international regional network by adding three more sites: (1) farmland in Haenam/Korea, (2) mixed tropical vegetation in Tak/Thailand and (3) short grassland in Tibet/China; whereas one of the domestic

sites (i.e., coniferous forest site in Gwangneung) has been shut down due to difficulties in management and a lack of trained scientists. During this domestic workshop, Prof. T. Hirano from Hokkaido University was invited for the workshop evaluation, representing the AsiaFlux committee. Several other domestic leading scientists and the project manager (Dr. S. Kwon) from Korea Institute of Environmental Sciences and Technology (KIEST) were also invited for evaluation.

Photo 1 KoFlux Domestic Workshop at Yonsei University

The workshop began with welcoming addresses of the KoFlux Chair, Prof. C. S. Rho, followed by Prof. T. Hirano. The first morning session started with Prof. J. Kim presenting the overview of KoFlux program and then the site reports were followed for CO_2 flux measurements at a broadleaf forest in Gwangneung, a farmland in Haenam, and a rice paddy in Hari. Also, soil CO_2 efflux measurement in Gwangneung forest was reported. Most of these sites have now accumulated almost a yearlong data of CO_2 flux. The second morning session continued with reports on soil CO_2 efflux measurements in Kumdan Mountain/Korea and canopy CO_2 flux measurements in Tak/Thailand and Tibet/China. The pilot study of CO_2 flux measurement at King Sejong station in Antarctic was also reported. The two afternoon sessions dealt with database, modeling and application of KoFlux studies. Supplementary measurements in eco-physiology and pan evaporation at KoFlux sites were reported. Modeling applications on carbon processes, footprint analysis, interaction with PBL and meso-scale processes. Finally, AsiaFlux-DIS based on GRID with Asia Pacific Advanced Network was introduced and the standard data-processing protocol was offered. The details of all the presentations are available from the web page of KoFlux (www.koflux.org) and some selected results from this workshop will be published in a special issue of Korean Journal of Agricultural and Forest Meteorology in the near future.

A Watershed-Scale Experiment on the Carbon Cycle of a Larch Plantation "CC-LaG (Carbon Cycle and Larch Growth) Experiment"

Kentaro TAKAGI, Kaichiro SASA, Takayoshi KOIKE (Hokkaido University, Japan)
Mamoru MAEBAYASHI (Hokkaido Electric Power CO., Inc., Japan)
Yasumi FUJINUMA (National Institute for Environmental Studies, Japan)

FSC-Hokkaido University has started on a study project of the carbon cycle monitoring on a larch plantation in 2001 in collaboration with CGER-NIES and Hokkaido Electric Power CO., Inc. In this project, 14 ha of a current conifer-hardwood mixed forest will be clear cut in January 2003, then 33,000 saplings of 2-year old hybrid larch (*Larix gmelinii*×*L. kaempferi*) will be planted in autumn 2003. The main purpose of this project is to evaluate the carbon sequestration capacity of the young larch plantation and to clarify the watershed scale circulation of materials. However, since the observation has been conducted on the mixed forest for 1.5 years before the clear-cutting, and will be continued

during the series of the management, the effects of forest clear cutting and of the larch planting on the watershed scale carbon and materials dynamics can also be clarified.

The study site is located on a flat terrace in Teshio Experimental Forest, FSC-Hokkaido Univ. (45° 03'N, 142° 06'E), which is the northernmost national university institution in Japan. The site was set in order to meet conditions of both the CO_2 flux observation by tower and the watershed hydro-chemistry cycle monitoring. Annual mean air temperature is 5.7° C, and the annual max and min values are ca. ±30° C, respectively. Annual precipitation is ca. 1000 mm and the half is by snow. Snow covers from November to April and the depth is ca 1.5 m. The current mixed forest of the study site is dominated by *Quercus mongolica ver. grosserrata*, *Betula ermanii*, *Betula platyphylla* var. *japonica*, *Abies sachalinensis*, and *Picea jezoensis*, and in the forest floor, dwarf bamboos, *Sasa senanensis* and *Sasa kurilensis*, form dense undergrowth.

Photo 1 Study site in winter

The project consists of three main monitorings, 1) CO_2 flux monitoring by the eddy correlation technique, 2) Catchment runoff and the water quality monitoring using an observation weir, and 3) Monitoring of the seasonal and inter-annual forest biomass changes. CO_2 flux monitoring is conducted by both open- and closed-path techniques at 30 m height with the micrometeorological observation. Runoff and the water quality monitoring is conducted by the periodic sampling of the stream water and litter to evaluate the carbon and nutrient output from the watershed as well as the continuous measurement of the stream runoff. Seasonal changes of the canopy and undergrowth LAI, and the litter fall rate, and inter-annual changes of the trunk diameter is monitored as the biomass monitoring. In addition, several sub-projects, such as "Biomass research of the mixed forest", "Effect of the regeneration manners on the forest carbon sequestration", and "Regional-scale carbon budget using GIS", are operated concurrently. Based

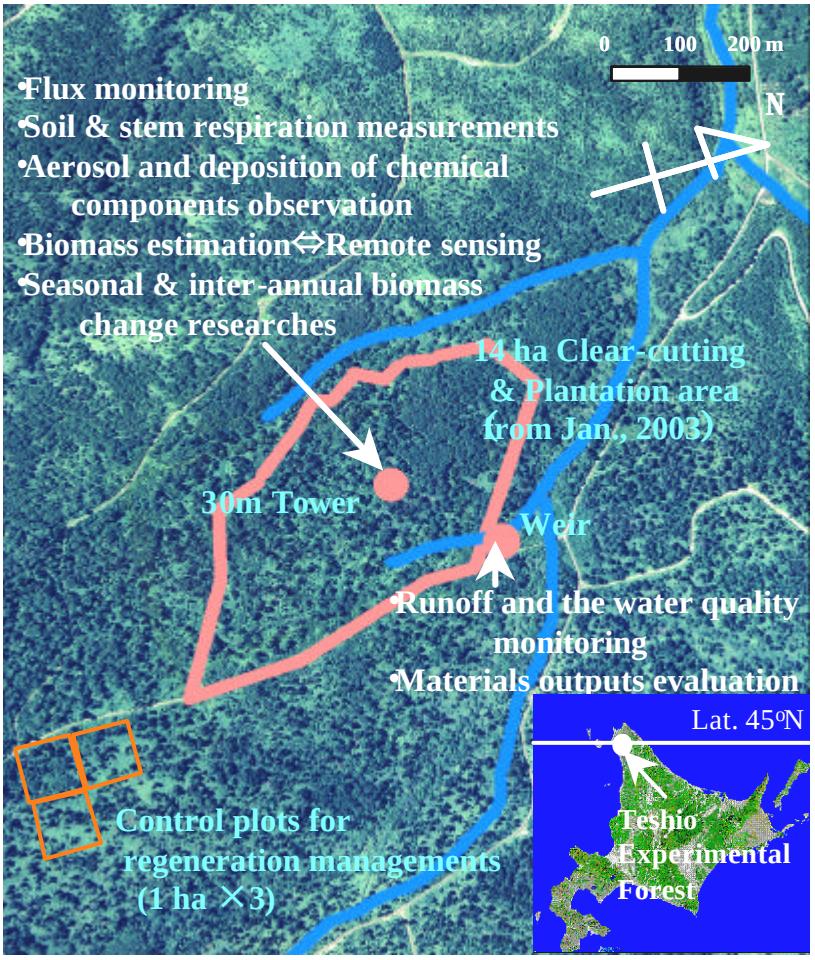

Fig.1 Outline of this project

on these researches, we aim at comprehensive understanding of the hydro-biogeochemical cycle of a snowy forest catchment and of the effect of the forest management on the carbon sequestration capacity.

Plantation ecosystems are now focused as an important carbon sink after Kyoto Protocol. We wish to manage this project not only as a scientific experiment on the forest carbon cycle but as an practical learning of forest management in the northern region. Furthermore, we will contribute to the comprehensive elucidation of carbon circulation in larch ecosystems, widely distributed in northeastern Eurasian continents, cooperating with the carbon flux projects of larch forests (Northeastern China, Central Siberia, and Tomakomai, Hokkaido) conducted by NIES, AIST and FFPRI.

(Please refer following URL for further information of this project. http://www-cger.nies.go.jp/~moni/flux/asia_flux/index.html)

Flux Observation at Pasoh Forest Reserve in Peninsular Malaysia

Makoto TANI, Yoshiko KOSUGI
(Kyoto University, Japan)

In order to elucidate the structure and biodiversity of tropical rain forest ecosystem and its roles in hydrologic conservations, an observation study granted by the Ministry of the Environment, Japan has been conducted in Pasoh Forest Reserve in Peninsular Malaysia since 1992. Pasoh is an important study site for long-term ecological monitoring, and in particular, this site is still famous because an intense biomass investigation was carried out by T. Kira and other ecologists as an activity of IBP around 1970. The site is located in Negeri Sembilan and the recent mean annual rainfall is about 1800 mm, which is rather small for a climate of tropical rain forest. There exists a primary lowland mixed dipterocarp forest under the climate, and it is surrounded by oil palm plantation areas. These environments concern us about its sustainability due to the drying and isolation stresses. Considering these anthropologic influences, our study is now continued to evaluate the ecological services of tropical forest ecosystem as a collaborative project organized by Malaysian institutions such as Forest Research Institute Malaysia (FRIM), Forest Department Negeri Sembilan etc., and Japanese institutions such as National Research Institute for Environmental Studies, Forestry and Forest Products Research Institute, universities etc.).

Photo 1 Observation tower at Pasoh Forest Reserve
Photograph is provided by Toshinori Okuda of National Institute for Environmental Studies, Japan, and the photograph permitted number is DPNM10.11.3 JLD45 (110) dated 17 Feb 1995.

A flux observation started there just after the observation tower was extended from 40 m to 52 m in 1995 and the study focused on the estimation of evapotranspiration. The results summarized that the latent heat flux continuously occupied large portions of net-radiation even in dry conditions. This tendency may be characterized in evergreen tropical forests such as an Amazonian rain forest (Shuttleworth: Proceedings of Royal Society London B 233, 1988) and a seasonal evergreen forest in Thailand where the study is now providing provisional results (Takizawa, unpublished). The study results including evapotranspiration characteristics from Pasoh can be reviewed in a new book published in April 2003 entitled

'Okuda, T. *et al*. (Eds.): Pasoh: Ecology and Natural History of a Lowland Tropical Rain Forest in Southeast Asia, Springer, Tokyo', and estimation results of four-year evapotranspiration will be published in IAHS Proceedings of HS02 in IUGG-Sapporo Assembly.

We applied to Pasoh only a short-term measurement of the eddy covariance method using a closed path system (see the results by Yasuda *et al.*, Agricultural and Forest Meteorology: 114, 2003) as well as intermittent measurements of Bowen ratio method. Due to recent developments of the open-path system constantly running by solar panels, our team of Forest Hydrology Laboratory in Kyoto University started a reorganized study in Pasoh and installed the system for a continuous monitoring of H_2O/CO_2 fluxes in September 2002. This study is also granted by the Ministry of the Environment, Japan, and involved in a project which aims at the evaluation of carbon sequestration by forest under various kinds of climate over Asia. Crosschecking the sequestration results from micro-meteorological and ecological studies is regarded as the most important methodology in this project, and Pasoh has been selected as a site with a long-term data of ecological investigations. Therefore, our studies focus on crosscheck comparisons of carbon sequestration obtained from micro-meteorological observation results such as CO_2 flux above canopy, soil respiration, vertical distribution of CO_2 concentration and meteorological/soil moisture environments with that from biochemical measurements of leaf photosynthesis and that from ecological investigations consisting of tree census and estimations of biomass, litterfall, fallen tree and decomposition.

Fortunately, we are strongly supported by Dr. Abdul Rahim Nik, Director of Forest Environment Division and other scientists and research assistants of FRIM. The electric power of AC240 V will be soon extended to the tower site. Although evaluating carbon sequestration from a small difference between large absorption and emission values in tropical forest is not easy, we aim at understanding flux responses of tropical rain forest against environmental changes and validating models developed for scale-up purposes using detailed observation findings based on a close collaboration between Malaysia and Japan.

Editor's Note

I've just come back from Pasoh Forest Reserve in Peninsular Malaysia. Pasoh is very impressive site where many groups are working on various topics, not only flux. Thanks everyone for giving me this opportunity.

The editor of AsiaFlux Newsletter No.5:
Yoshiko KOSUGI
(Kyoto University)

The editor of AsiaFlux Newsletter No.6 will be Wonsik KIM (Yonsei University).

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