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AsiaFlux Newsletter

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Report on the Joint Conference of 11th AsiaFlux International Workshop, 3rd Hydrology delivers Earth System Science to Society (HESSS), and 14th Annual Meeting of Korean Society of Agricultural and Forest Meteorology -19 ~ 24 August 2013, Seoul, Korea-

Minseok Kang and Conference Organizing Committee

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While the boundaries between academics have become blurred, the integrations of academic disciplines for (re) solving the questions facing humanity, are not something that started just recently. For example, one of the 'Millennium Prize Problems', the Poincaré conjecture was proven by Grigori Perelman through integrations of various academic disciplines such as topology and physics, not only mathematics. In this context, a joint conference among different scientific communities is no longer an uncommon attempt. The joint conference between AsiaFlux and HESSS (Hydrology delivers Earth System Science to Society), which had been initiated during the 2nd HESSS-AsiaFlux Symposium at the University of Tokyo in 2010, was finally held in Seoul National University (SNU) from 21 to 24 August 2013 together with Korean Society of Agricultural and Forest Meteorology (KSAFM) (Fig. 1).

As pointed out in the welcome address from chair and vice chairs of AsiaFlux, the purpose and necessity of the joint conference are as

Fig. 1. A group photo of the joint conference

follows. The theme was "Communicating Science to Society: Coping with climate extremes for resilient ecological-societal systems." Humanity has emerged as a major force in the operation of the biosphere, challenging ecological-societal resilience. This urgent situation necessitates a fundamental shift in our perspectives, worldviews, and institutions. The organizing committee hoped that the joint conference would provide a great opportunity for scientists, practitioners, and the public (1) to better understand the latest scientific achievements and (2) to help develop educational, technical, and socio-economic options to reconnecting to the biosphere and becoming active stewards of the Earth Systems as a whole.

The joint conference was co-hosted by National Center for AgroMeteorology (NCAM) and Interdisciplinary Program in Agricultural and Forest Meteorology (AgFM) in SNU, and sponsored by Asia-Pacific Network for Global Change Research (APN), Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (IGSNRR, CAS), Korea Forest Service (KFS), Korea Meteorological Administration (KMA), Korean Meteorological Society (KMS), Korean Research Institute of Standards and Sciences (KRISS), LI-COR Biosciences, Inc., NCAM, National Institute for Agro-Environmental Sciences (NIAES), National Institute for Environmental Studies (NIES), Rural Development Administration (RDA), SNU, and the University of Tokyo. More than 200 scientists and students participated in the joint conference from 24 countries, and we had 120 oral and 60 poster presentations.

Pre-Conference Training Courses

Prior to the joint conference, intensive training courses on flux measurement were held in SNU from 19 to 20 August 2013 (Fig. 2). The training courses were hosted by LI-COR Biosciences, Inc. and SNU. About 50 young scientists and students from 13 countries participated in the training courses. The participants were trained for (1) understanding eddy covariance theory, experimental design and applications, (2) understanding operation theories of gas analyzer and sonic anemometer, (3) being able to set up and operate eddy covariance systems, and (4) being able to process raw flux data with EddyPro® (eddy covariance data processing application).

Welcoming and Opening Session

On the first day, there were welcome addresses from the representatives of the hosts and the

academic communities (Profs. Hak-Lae Lee, Taikan Oki, Man Yong Shin, Eun Woo Park, and Joon Kim). After the welcome addresses, Prof. Joon Kim (Intro: taking stock & looking ahead) introduced the purposes, vision and key questions of the joint conference.

Plenary Sessions

During the first plenary session, Dr. Ray Leuning (Communicating (climate) science), Prof. Murugesu Sivapalan (Socio-hydrologic modeling to understand and mediate the competition for water between humans and ecosystems: Murrumbidgee river basin, Australia), and Prof. Benjamin Ruddell (Better understanding of complex coupled human natural systems: New approaches and concepts) presented their concerns on 'Communicating science to society.' We identified the challenges on how to integrate our researches into society and the possibility of new approaches and concepts. During the second plenary session (Coping with climate extremes), two keynote speeches were provided by Prof. Hugo Berbery (Droughts in southern South America: large-scale dynamics and regional processes) and Dr. Markus Reichstein (Climate extremes and its impacts on the carbon cycle), in which the impacts of climate extremes (e.g., droughts) on the ecological-societal systems were discussed. During the third plenary session, Prof. James Famiglietti (Water cycle change and the human fingerprint on the water landscape) and Prof. Taikan Oki presented about the recent research progresses in 'Water and food security.'

Break-out Sessions

There were break-out sessions of three communities on the second day and the third day morning. For AsiaFlux, there were 67 presentations in the eight sessions (i.e., Linking regional flux networks; Effects of climate extremes and human disturbances on ecosystems; Current issues in flux monitoring; Carbon tracking in Asia; Challenges in quantifying greenhouse gas emissions across soil surface; Communicating carbon and water science to society; Tropical and subtropical ecosystems: vulnerability and resilience; Process studies from leaf to canopy). For HESSS, there were 19 presentations in the four sessions (i.e., Recent progresses in hydrologic simulations; Capacity building with new data and methods; Natural and human-induced changes of hydrologic cycles; Understanding water and carbon dynamics). For KSAFM, there were 11 presentations in the two sessions (i.e., Networking ecological observation and modeling in Korea; Biometeorological modeling and assessment). In each session, the speakers presented about the recent research progresses and the participants conducted in-depth discussions about the issues.

Joint and Special Sessions

On the third day, there were two joint sessions between AsiaFlux and HESSS (i.e., Human society, history, and water in changing world; Bridging the gap between local measurement and large scale modeling) and two joint sessions between Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS) and other research programs (e.g., iLEAPS/IGAC/WMO joint initiative: interdisciplinary biomass burning initiative (IBBI) – Asian perspective; iLEAPS/GLP/AIMES joint initiative: Interactions among managed ecosystems, climate, and societies (IMECS) – Asian perspective). As an extension of training courses, there was a special session from LI-COR Biosciences, Inc. on using the EddyPro® program.

Fig. 2. A group photo of pre-conference training courses

Fig. 3. Young scientist meeting

AsiaFlux Science Steering Committee Meeting and Young Scientist Meeting

On the second evening, there were AsiaFlux Science Steering Committee meeting (SSC) and Young Scientist meeting (YSM). In the SSC, International Rice Research Institute (IRRI, Philippines) was chosen to host the 2014 AsiaFlux workshop, and the schedules of other conferences and training courses were discussed. The 2013 joint YSM of AsiaFlux, HESSS, and KSAFM had more than 60 young scientists from 19 countries (Fig. 3). Especially, we were pleased to have nine guests (i.e., seven plenary session speakers and two senior researchers such as Drs. Yoshinobu Harazono and Kazuhito Ichii) attended the meeting and share their valuable experiences in research and life. The number of guests was the largest since 2007.

Poster and Closing Sessions

We had about 60 poster presentations. It was the first time in AsiaFlux workshop to select the outstanding student posters. The winners were Mr. Juhan Park (Estimation of changes of carbon balance after thinning of 50-year-old Pinus Koraiensis stands with sap flux measurements), Mr. Tserenchunt Battumur (Estimating change of inter-annual green-up variability in Mongolia), and Mr. Sung-Hyun Min (Soil respiration in rice and barley double cropping paddy-field in Korea), and the participants celebrated winning the awards during the closing session. There were rapporteur's sessions reporting the summary and synthesis of individual sessions held during the joint conference. They reported: (1) brief descriptions of major concerns, (2) major findings to communicate to science community, and (3) key message to communicate to the society for each session. The participants, organizing committee and staffs celebrated the success of the joint conference and promised to meet again at the next joint conference in 2016 in California, USA.

Field Excursion

During the joint conference, AsiaFlux and iLEAPS laid the groundwork for their collaboration researches: iLEAPS-Korea was newly launched and there were the joint sessions between iLEAPS and the other research programs. In this context, destination of field excursion was the main research site of iLEAPS-Korea, Taehwasan University Forest, which is composed of 497 ha of natural hardwood forest and 300 ha of pine plantation (Fig. 4). Profs. Meehye Lee and Hyun-Seok Kim introduced the research sites and ongoing researches in Taehwasan University Forest.

In this joint conference, there were many novel approaches in AsiaFlux workshop: (1) submission of the session proposals, (2) maximum five parallel sessions, (3) session rapporteurs (the participants can obtain summaries of the missed sessions), (4) on-line participation and presentation via Skype from other flux network (Prof. Dennis Baldocchi from FLUXNET and Dr. Eva van Gorsel from OzFlux; for linking AsiaFlux to the other flux networks), (5) pre-conference

training courses (offering the trainees an opportunity to experience what they learned), (6) outstanding student poster awards (an extra incentive for students), (7) luncheon movie, and (8) web based payment system (it was convenient for not only staffs but also participants). The organizing committee hopes that these new attempts will continue in our future AsiaFlux workshops as more developed forms. The organizing committee appreciates the financial supports from sponsors mentioned above, and the participants from all over the world. We would like to specially thank the staffs for their devotion to manage the joint conference successfully.

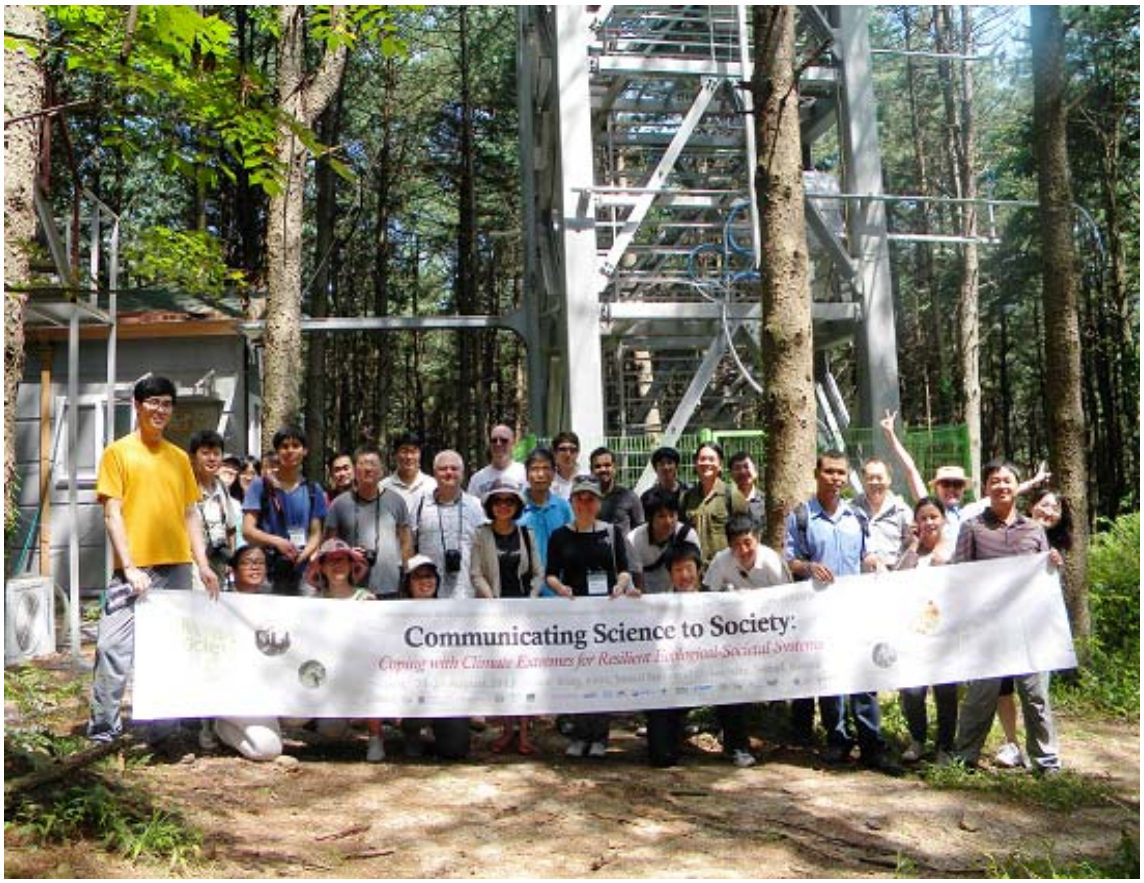

Fig. 4. A group photo of field excursion to Taehwasan University Forest

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Thinking Community, Learning Frontier

Joon Kim (Former Chair, 2008-2014)

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It has been 15 years since AsiaFlux has become a part of my life. All those years have been so exciting and grateful to have witnessed the growth of AsiaFlux both in quantity and quality along with deepened friendship among members. As one of the starting members of AsiaFlux, I have learned and embraced the vision cast and carried by my predecessors - Drs. Yoshihiro Fukushima and Susumu Yamamoto. Then, as the vice-chair, I have served with and learned from Dr. Yoshikazu Ohtani about the genuine leadership based on excellence in science and humility in character. As the chair since 2008, I had the privilege of serving with wonderful chair board and the dedicated members of science steering committee, who all have embraced the AsiaFlux vision as their personal vision. My heart goes out with sincere thanks and respect to all of them for their tenacious determination not only to see it through but also to live it through together with unreserved supports.

Our vision is the magnet for commitment, the key to unity, and the determinant for destiny. Since 1999, the AsiaFlux vision has been refined with an expanded scope from carbon science to regional stewardship. Yet, a much more integrated and participatory collaborations will be still needed to fulfill our vision – a community where science and technology work more directly for sustainable ecological-societal systems in Asia. The shared vision stands as the gateway to our community’s promising future. Under the leadership of new chair board led by Dr. Akira Miyata, who has already established an exciting flagship program – CarboAsia, we will continue to be a landmark platform in presenting, discussing, and providing better understanding and learning of our complex ecological-societal systems in Asia.

Finally, I want to thank Dr. Yoshinobu Harazono who had guided me into this inspiring community after our first encounter in 1995. It is so encouraging to be served by such a great mentor who not only knows where he is going but also invites us to journey with him. So, please come and join us in AsiaFlux, and meet your friends, mentors, and protégé!

Report on AsiaFlux Training & Seminar on Methane Flux and Carbon Cycle – 23~27 February 2014, BAU, Mymensingh, Bangladesh

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Methane is one of the main greenhouse gasses and it is considered as second global warming contributor next to CO_2. Methane used to be measured by chamber method since 1980s, but open-path methane analyzer was commercially available recently and the number of tower flux sites which start methane flux measurement is increasing in Asia. Since measurement by open-path analyzer is typically new, there were needs from people who involve methane flux measurements to further understand the instruments and share information of gathered data. Therefore, AsiaFlux, Bangladesh Agricultural University (BAU), National Institute for Agro-Environmental Sciences (NIAES), Japan; National Institute for Environmental Studies (NIES), Japan; and Graduate School of Horticulture, Chiba University, Japan co-organized this training and seminar, sponsored by Asia-Pacific Network for Global Change Research (APN), and NIES. The AsiaFlux training and seminar on methane flux and carbon cycle was held on 23-27 February, 2014 in BAU, Mymensingh, Bangladesh. About 40 researchers and students from 11 countries were participated (Fig. 1). The objective of this training and seminar was to help young researchers and graduate students understand the fundamentals of methane flux measurement using eddy covariance (EC) technique. We appreciate the financial supports from the sponsors mentioned above. We would like to specially thank the organizing committee and staffs for their devotion to manage the training and seminar successfully.

1. LI-COR training course

First three days was training course facilitated by LI-COR Biosciences, USA. The training course was focused on not only methane flux measurement, but also general flux monitoring by eddy covariance technique. First, the trainees learned fundamental theories related to eddy covariance technique and how to start flux measurement including how to select site and what kind of maintenances are necessary. Then, the trainees built up flux monitoring station by themselves in the classroom (Fig. 2). Lastly, the trainees learned how to process data using EddyPro™ (LI-COR Biosciences., USA).

2. Seminar on methane flux and carbon cycle

During the seminar, participants shared study from their own flux measurements site. We had 15 presentations and many of them are study

Fig. 1. A group photo of training course participants

Fig. 2. During the LI-COR training course

Fig. 3. During the seminar on methane flux and carbon cycle

from South and Southeast Asia (Fig. 3). At the beginning, there were welcome addresses from Prof. Md. A. Baten and Prof. Lutful Hassa (BAU) and they encouraged all the participants to maximize this opportunity. Prof. Joon Kim (Seoul National University (SNU), Korea) delivered a congratulatory address by letter.

After the welcome addresses, there was a keynote presentation from Dr. Prabir Patra (Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan, Title: Budgets of major greenhouse gases (CO_2, CH_4 and N_2O) from the south and southeast Asia region). Dr. Patra presented his ongoing research to estimate GHG balance both the synthesis and reconciliation of top-down (atmospheric observations and inverse models) and bottom-up estimates (ground-based flux observations and terrestrial models) approaches. He emphasized importance of methane flux measurement data in south Asia for further synthesis model simulations, where the agricultural sector is one of the main sources of methane emission. Dr. Akira Miyata (NIAES, Japan) also mentioned in his greeting via Skype the importance of South Asia in the AsiaFlux activity.

After the keynote speech, each presenter shared his/her recent research progress and had discussions. All the participants shared their idea related to the issues. Dr. Ma. Carmelita Robielos Alberto (International Rice Research Institute (IRRI), Philippines) reported the findings from methane flux measurements at IRRI and mentioned that seasonal variations in daily CH_4 emissions were primarily controlled by water management and the growth of the rice plants and emphasized importance of water management during the vegetative stage to control CH_4 emissions. Prof. Masayoshi Mano (Chiba University, Japan) shared the results from BAU methane flux measurements, and he found higher methane flux values compare to those at other flux sites and a peak emission was found at the transplanting stage of Amon. Since he just installed instrument in 2013, need more data to understand seasonal variations. Other studies such as chamber based methane flux measurement and CO_2 flux measurement from BAU site was also shared from other participants. Dr. Shiva Rodda (Indian Space Research Organization, India) reported the primary result of eddy-covariance methane flux measurements in mangrove site in India. They also just started in 2012, but showed the seasonal variations of methane flux from evergreen mangrove forest. In addition, the measurement technique related topics were also discussed: Dr. Kazunori Minamikawa (NIAES, Japan) shared about standardizing the measurement techniques of chamber methane flux measurement, Dr. Keisuke Ono (NIAES, Japan) provided helpful information by comparing closed and open path methods in terms of eddy-covariance CH_4 flux measurement, and Wonsik Kim (NIAES, Japan) introduced FluxPro program that provides real-time monitoring and surveilling system for eddy covariance flux measurement.

Another target of this seminar was to promote understanding carbon cycle in Asian ecosystems. Dr. Derrick Lai introduced his new project on carbon dynamics at mangrove sites in Hong Kong. Dr. Chandra Shekhar Deshmukh reported how the regional greenhouse gas balance in a mountainous area of Laos was altered in response to building a dam. Asian forest ecosystems have largely been modified by human activities for last several decades and are now related to Reducing Emissions from Deforestation and forest Degradation (REDD) activities. Dr. Hammad Gilani proposed a synthetic approach to monitor

the carbon stock in Nepal using ground measurements and satellite data.

In the overall discussion session, some key questions were raised, which could be categorized into topics of knowledge gap and scientific experience. We also discussed how to deepen our studies. Flux studies have not usually been popular in many Asian countries. Meetings that focus on specific topics, like this training and seminar, could be a promising opportunity to develop our capacities.

It was the first time we had training and seminar on flux monitoring in Bangladesh, but we had active and fruitful discussions based on interesting primary results. Flux data from Asia region is very precious for further synthesis analysis and we hope this training and seminar will help as a starter for those research.

3. Field excursion

We visited Mymensingh flux measurement site in BAU (Fig. 4). Rice paddy is a major agricultural ecosystem in Bangladesh. Arable lands cover its 65% of the total land area, which is the highest percentage in Asian countries (Rahman et al., 2001), and 79.4% of the total arable lands are used for rice paddy cultivation throughout the year either single, double or triple cropping pattern (Food and Agriculture Organization, 2008). Rice paddy fields are one of the largest anthropogenic sources of methane. With respect to methane emission from rice paddy field, Bangladesh is the third largest methane emission country in the world (Yan et al., 2009). As an agricultural based country, BAU plays a vital role for the development of Agricultural sector in Bangladesh since in 1961. In this continuation, Prof. Baten first started flux measurement for monitoring carbon and energy fluxes from rice paddy field using eddy covariance (EC) technique at this university since February, 2006 collaboration with NIAES, Japan. Recently, Chiba University of Japan installed LI-7700 open-path methane gas analyzer to the ongoing eddy covariance system for measuring methane flux in this site on August 12, 2013.

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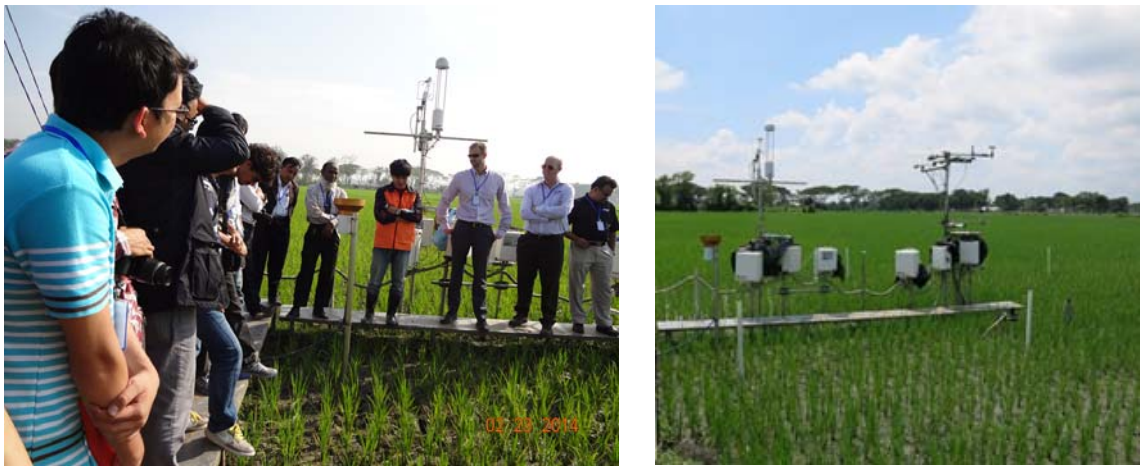

Fig. 4. Mymensingh flux study site, BAU

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12th AsiaFlux Workshop 2014
-Bridging Atmospheric Flux Monitoring to National and International Climate Change Initiatives-

Ma. Carmelita Alberto

Workshop Local Organizing Committee
International Rice Research Institute, Los Baños, Laguna, Philippines

The 12th AsiaFlux Worskop was held on 18 -23August 2014 at the International Rice Research Institute (IRRI) in Los Baños, Laguna, Philippines (Fig. 1). This is the third AsiaFlux workshop held in Southeast Asia: the first workshop was organized in Cheng Mai, Thailand in 2006 and the second workshop in Johor Bahru, Malaysia in 2011. The theme of the 2014 workshop 'Bridging Atmospheric Flux Monitoring to National and International Climate Change Initiatives' is part of the continuous endeavor towards the fulfillment of AsiaFlux mission which is to bring Asia's key ecosystems under observation to develop and transfer scientific knowledge in order to ensure the quality and sustainability of life in Asia. The terms such as 'monitoring' and 'under observation' go beyond just measurements and include synthesizing the observations to potential narratives and providing feedbacks, which serve as the source of the community learning toward sustainability.

Fig. 1. 12th AsiaFlux workshop participants

According to Dr. Akira Miyata (Chair of AsiaFlux), AsiaFlux has three significant reasons to hold its regular workshop at IRRI. Firstly, it is located in tropical Asia, which attracts increasing attention of our community. AsiaFlux has been focusing on tropical ecosystems in monsoon Asia since the workshop in Johor Bahru, Malaysia in 2011. The AsiaFlux Workshop 2014 in the Philippines will help us to intensify our activities in South and Southeast Asian countries. Secondly, IRRI is one of the focal points for research of crop science in the world. We expect the workshop here to provide us with the best opportunity to discuss how to promote flux studies in Asian agricultural ecosystems, which to date has drawn less attention in our community than forest ecosystems. Finally, IRRI has a long history of methane flux studies. Owing to recent improvement of gas analyzers, the technique for continuous measurements of methane flux has come to fruition. The number of eddy-covariance flux tower sites with methane eddy flux measurements has been increasing worldwide. It is timely for us to have the workshop here to discuss our progress in methane flux studies with attendance of scientists well-versed in methane studies in rice fields.

For this purpose, the AsiaFlux Workshop 2014 provided a platform for scientists and the like who are interested in ecosystem science in Southeast Asia to congregate, share information, and discuss future collaborations to consolidate and strengthen the Southeast Asian flux site networks.

The workshop started with a 2-days training course (18-19 August) on monitoring net ecosystem-scale fluxes using eddy covariance and profile measurements. The actual workshop, which took place on 20-22 August, comprised of six oral sessions, one poster session, and a special session which highlighted ongoing experiments conducted by IRRI aiming at higher rice productivity alongside with reducing environmental footprints. This workshop also provided opportunities for young scientists to express their views and experiences related to flux observation in the Young Scientist meeting. More than 110 participants from 19 countries attended the workshop, where 44 oral and 31 poster presentations were presented.

Short training course

The training course encompassed recent advances in micrometeorological instrumentation and the use of Campbell Scientific systems in ecosystem-scale flux monitoring. The course had particular emphasis on sonic anemometry, open-path and closed-path eddy covariance systems, and atmospheric profile systems. Basic theories and assumptions were discussed with respect to proper use and installation of instrumentation. The training course was attended by more than 30 participants (Fig. 2). The training was given by competent Campbell Scientific Applications Engineers and Scientists (Sasha Ivans, David Hammond, Gavin Hewitt, and Thitipong Chindavijak).

Fig. 2. Training Course participants

Opening Session

The 12th AsiaFlux Workshop was officially opened on 20 August 2014 with the inspiring welcome messages from Dr. Robert Zeigler, Director General of IRRI; Dr. Akira Miyata, Chair of AsiaFlux; and Dr. Reiner Wassmann, Chair of AsiaFlux Workshop Local Organizing Committee, IRRI (Fig. 3). The opening session was highlighted by a video presentation specially prepared by Ms. Berns Joven.

Oral Sessions and Invited Speakers

There were six oral sessions and one special session presented: (1) Special session - Linking mitigation efforts to natural resource management: IRRI's activities on determining GHG fluxes from rice-based ecosystems (convened by Reiner Wassmann and Maricar Alberto); (2) Session A – Carbon and water cycles in tropical and subtropical Asian ecosystems in changing environment (convened by Nobuko Saigusa, Amnat Chidthaisong, and Takashi Hirano); (3) Session B – Impacts of extreme climate and disturbances on carbon, water and material cycles in terrestrial ecosystems under monsoon climate (convened by Ryuichi Hirata and Kentaro Takagi); (4) Session C – Linking flux monitoring to climate change initiatives in agro-ecosystem (convened by Akira Miyata, Wonsik Kim, and Keisuke Ono); (5) Session D – Model-data integrative analysis towards better understanding of terrestrial carbon budget in Asia (convened by Masayuki Kondo and Kazuhito Ichii); (6) session E – Soil-plant-atmosphere interactions: mechanisms, responses, and approaches for understanding the Asian terrestrial carbon cycle (convened by Naishen Liang and Jin-Sheng He); and (7) Session F – Up-to-date techniques and understanding for trace gas and methane fluxes (convened by Yoshiyuki Takahashi and Masahito Ueyama). (Fig. 4)

Five invited speakers graced the AsiaFlux workshop 2014 by sharing their expertise and current studies: (1) Dr. Dennis Baldocchi (Role of weather, land use and management on greenhouse gas fluxes in Sacramento Delta); (2) Tomo'omi Kumagai (Carbon and water cycling researches in southeast Asian tropical forests); (3) Tamotsu

Fig. 3. Opening Session

Fig. 4. Oral Sessions

Sato (EA-FDPN: Plots network for forest and carbon dynamics from Siberia to tropical zone); (4) Xuhui Lee (Land use changes, energy fluxes and surface climate); and (5) Jin-Sheng He (Carbon and methane fluxes from alpine grassland and wetland on the Tibetan plateau: effect of climate warming and water table decreasing).

Poster Sessions

There were two poster sessions held on 20 August (1545-1630H) and on 21August (1115-1200H). The poster sessions provided ample time for in-depth interactions between the authors and the rest of the workshop participants (Fig. 5). The AsiaFlux Workshop Scientific Steering Committee also evaluated all the poster presentations of the young scientists for the 'Best Poster Paper' award.

Fig. 5. Poster Sessions

Young Scientist Meeting

The Young Scientist Meeting (YSM) is an important part of the AsiaFlux Workshop. YSM has been kicked off in January 2008 under the framework of AsiaFlux. This year's YSM was organized by Keisuke Ono, Caesar Arloo Centeno, Minseok Kang, and Motonori Okumura. The meeting aims to provide opportunity for: (1) discussions with outstanding senior and young scientists from in and outside Asia on a range of topics including science and career paths; (2) sharing experiences with the speakers and among the young

Fig. 6. Young Scientist meeting

scientists on particular fields of research; (3) the young scientists to relate their career paths with the success stories of the speakers; and (4) future collaborations between young scientists and the speakers (Fig. 6). About 40 young scientists from China, Korea, Malaysia, Indonesia, Hong Kong, Singapore, Japan, and the Philippines participated in this meeting.

Business Display

The organizing committee of AsiaFlux Workshop 2014 would like to thank all the companies that have given great support through their participation in the business display throughout the workshop. The participating companies are EKO Instruments Co., Ltd., Campbell Scientific, Kipp & Zonen Asia Pacific Pte., Ltd., and LICOR, Inc. (Fig. 7).

Fig. 7. Business Display


Fig. 8. Best Poster award winners



Fig.9. 'Early Bird' award winners


Fig. 10. Tokens of appreciation to the 5 invited speakers and 4 Campbell Scientific trainers

Awards and Closing Ceremony

Two young scientists garnered the 'Best Poster Paper' award, namely, Ayaka Sakabe and Kojiro Hirayama (Fig. 8). The local organizing committee initiated the 'Early Bird' awards for those who have paid the registration fees first: (1) international participant - Montri Sanwangsri; (2) local participant - Caesar Arloo Centeno; and (3) Business Display – LICOR, Inc. (Fig. 9).Tokens of appreciation were likewise given to the 5 invited speakers and to the 4 Campbell Scientific trainers (Fig. 10).

The closing remark was given by Dr. David Johnson, Head of Crop & Environmental Sciences Division, IRRI.

Banquet and Farewell Dinner

All the participants were warmly welcome during the banquet which was held at the IRRI Guest-House on 20 August 2014 (Fig. 11). There were cultural performances by the University of the Philippines at Los Baños (UPLB) Dance Troupe. They showcased some of the dances in the different parts of the Philippines. The UPLB Dance Troupe was also successful in encouraging the AsiaFlux participants to join them as they dance the famous 'Tinikling', i.e., dancing along bamboo poles.

The Farewell Dinner was held in Bonito's Bar and Restaurant along UPLB Grove on 22 August 2014 (Fig. 12). The participants had a good chance to enjoy different Filipino dishes, appetizers, desserts, and drinks.


Fig. 11. A taste of Filipino food, culture and hospitality (left) Fig. 12. Farewell Dinner (right)

IRRI Tour

The AsiaFlux participants had a glimpsed of the IRRI Rice World Museum. The museum exhibits artifacts concerning the rice-growing world and shows the important role of rice through Multi-media and photo exhibits. The display area contains a large collection of rice artifacts, farming tools, farm machineries, rice products and by-products, illustrations of rice ecosystems, samples of rice seeds from different parts of the world, replicas of rice granaries, farmers' clothing, insects that are friendly and harmful to rice, photographs of women rice farmers, and representations of rice biotechnology. There are also sections in the museum, which have computer terminals and 'hands-on' models to enhance the learning experience (Fig. 13).

Fig. 13. IRRI Rice World Museum

The IRRI Field tour (22 August 2014) consisted of visits to 2 experimental sites: (1) the Ecological Intensification Platform and (2) the ICON fields (Introducing Non-Flooded Crops in Rice-Dominated Landscapes: Impact on Carbon, Nitrogen and Water Cycles). These 2 study sites provide opportunities for developing and researching probable futuristic rice production systems that are environmentally and economically sustainable. These studies contribute to process-based research on element cycles and GHG emissions, e.g. by using Eddy Covariance techniques and chamber-based measurements (Fig. 14)

Fig. 14. IRRI Field Tour

Fig. 15. Excursion Option A: Tagaytay Tour

Excursion

The local organizing committee had organized two excursions after the workshop (23 August 2014):

Option A (Tagaytay Tour)

This tour started with Ilog Maria Bee Farm, which is the largest producer of honey and other bee products in the country. Then the participants had a sumptuous lunch at Sonya's Garden, which offers romantic nature garden dining. The day ended in Tagaytay Picnic Grove which showed a good vantage view of Taal Volcano Island in the middle of a lake (Fig. 15).

Option B (Laguna Tour)

This tour started with Costales Nature Farm, which is a prime agro-tourism destination that conducts ecological and balanced farming techniques in order to promote sustainable agriculture, healthy lifestyle, and environmental diversity through integrated natural farming. The tour ended in Makiling Botanic Gardens, which was designated as a tourist destination and as a recreational and educational facility for the general public since 1965 (Fig. 16).

Fig. 16. Excursion Option B: Laguna Tour

Report on the AsiaFlux Training & seminar on tropical ecosystem monitoring 1-5 December 2014, National Park Cat Tien, Vietnam

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Tropical ecosystems are the most diverse ecosystems with high magnitude of carbon and water turnover. Incidentally, these ecosystems are the most disturbed in modern times. Now we see an increasing interest in study of functional processes in tropical ecosystems and their role in biosphere-atmosphere exchange of water and trace gases. AsiaFlux has been collaborating and supporting those studies in Southeast and South Asian countries. As part of those activities, AsiaFlux provided a training and seminar on tropical ecosystem monitoring, which was held in headquarters of Cat Tien National Park, a part of Dong Nai Biosphere Reserve, Vietnam. Nearly 50 participants from 23 institutions of 9 countries attended the seminar. Hands-on training courses on ecosystem monitoring and data processing were the main activities. (Fig.1)

The course provided by LI-COR Inc., was carried out on 1-3 December 2014. It covered a range of topics on measurements in ecosystems, with focus on quantification of greenhouse gases and energy fluxes by means of eddy covariance technique. Training was started from the basics and theory of the eddy covariance, with explanation of possible sources of errors and uncertainties in measurement results. A possible application of the method in scientific and industrial purposes was discussed. Instrumental part of the training was to explain the principles of operation and interaction of NDIR and WMS gas analyzers, such as LI-COR LI7500A and LI7700, sonic anemometers and other biometeorological sensors and auxiliary equipment. New advantages of on-site data integration and processing using the SmartFlux system were shown. A demonstration eddy covariance and biometeorological measurement complex was assembled and adjusted by participants for a given site specification. Data process-

Fig. 1. Training course and seminar participants

ing part of the training gave participants the skills of raw eddy covariance data processing using EddyPro software and interpretation of outputs for data quality assessment and analysis. The last part of training focused on soil respiration and LAI measurements. The LI-8100A Automated Soil CO_2 Flux System was presented with use of survey or long-term automated chambers. Main physical principles and common mistakes of soil respiration measurement were discussed. LAI-2200C Plant Canopy Analyzer was presented as an instrument for leaf area index measurements, with explanation of specifications and principles of operation and LAI calculation and practical recommendations for taking measurements.

Many of the participants for the first time were acquainted with the methods of ecosystem flux measurements, and more experienced participants had the opportunity to deepen their knowledge in these areas and discuss directly with representatives of the equipment manufacturer. (Fig.2)

Fig. 2. During training course and seminar

Seminar on tropical ecosystem monitoring

The seminar was opened by welcome addresses from Chair of AsiaFlux Dr. Akira Miyata. Two keynote speakers were then followed. The first one was delivered by Dr. Yoshiaki Kitaya from the Graduate School of Life and Environmental Sciences, Osaka Prefecture University, Japan. He updated the current situation of mangrove forest and emphasized the importance of improving our knowledge and understanding for this forest ecosystem. Dr. Alex Guenther (Pacific Northwest National Laboratory, Richland WA, USA) presented the lecture on "Ecosystem–atmosphere exchange of biogenic volatile organic compounds". The main subjects of lecture included current understanding of the processes linking air quality, climate and biogenic organics and their potential feedbacks. The need for long-term, canopy-scale monitoring of Biogenic Volatile Organic Compounds (BVOCs) was discussed and measurement techniques were described. After the keynote speeches, each presenter shared his/her recent research interests, and joined by discussions from the audiences.

This was followed by presentations from participants. A presentation by Dr. Juliya Kurbatova and Vitaly Avilov showed the results of studies of heat, water and carbon fluxes measurements in monsoon tropical forest of Cat Tien National Park. Robert Sandlerskiy presented his findings on the feasibility of tropical forest classification by means of multispectral satellite data analysis.

The lectures by scientists from India introduced a wide range of flux studies conducted in their country. Rakesh presented the studies of carbon fluxes and biomass density over central Indian deciduous forests; Dr. Singh presented his findings on carbon, water and energy dynamics in Himalayan forests ecosystem; Dr. Banerjee shared about latent energy flux over rice field. He pointed out that efficient use of irrigation water requires proper estimation of evapotranspiration.

Dr. Kasturi Devi Kannian introduced his studies of fluxes in urban ecosystem in Malaysia. Joseph Waili reported about eddy covariance measurements of evapotranspiration from a tropical peat swamp forest in Sarawak (Malaysia); Cheng Yu Lan shared studies of surface fluxes of a subtropical broadleaf forest at the Lien-Hua-Chin experimental watershed in central Taiwan; Dr. Tassanee Jiaphasuanan from Thailand shared her study results on methane and nitrous oxide emission from irrigated rice field with different cultivation practices.

Dr. Koji Tamai from Japan reported on the roles of tower observation in the development of CO_2/H_2O cycle simulation model for forest ecosystem; Hironori Arai presented his findings on methane emission and soil microbiological properties in mangrove forest soils; Dr. Kazuyuki Inubushi from Chiba University reported about effect of topography on N_2O and CO_2 emissions and dissolved N_2O in palm plantation in Indonesia.

For participants it was very useful and interesting

to know about the development of flux measurements in Vietnam. Dr. Duong van Hau from Hue University of Agriculture and Forest presented the results of water management on growth, development, yield of rice and greenhouse gas emissions in Central Vietnam. Joint presentation of Truong van Vinh (Non Lam University) and Nguyen Thanh Nho (University of Science, Vietnam) introduced the ability of mangroves to fix atmospheric greenhouse gases in Mekong river.

The seminar was finished by joint discussion about tropical ecosystem monitoring.

Field excursion (Fig.3)

The field excursion to Nam Cat Tien Forest (NCT) flux monitoring site was held on 5 of December. The flux monitoring site was established in late 2011, but many scientific researches were conducted in the Nam Cat Tien since 1990-s (Vandekerkhove & Chinh 1993; Blanc et al. 2000; Tiunov 2011).

The site is placed in seasonally-dry tropical forest dominated mainly with *Lagestroemia caluculata, Afzelia xylocarpa, Sindora siamensis*, canopy height is about 35 meters. Mean annual temperature recorded at nearest long-term weather station (Đồng Xoài) is 26.4°C and mean annual precipitation is 2518 mm.

Eddy covariance instruments installed on the top of 50-m height stout tower of 2x2m cross-section, along with solar radiation and other weather sensors. There is 8-level profile system for CO_2 and sensible heat below-canopy storage assessment, which is very important for tropical forests. The site also equipped with extended soil temperature and water content monitoring system, which consists of 3 sets of sensors on 4 depths from 5 to 50 cm. All instruments are operated autonomously using solar panels as a source of energy.

Soil respiration and tree litter deposition are measured on 100-m transect with 20 sampling points. Also short-term soil respiration was measured with custom made automatic chamber, aiming to estimate diurnal variations of soil respiration and its dependence on soil temperature.

Nam Cat Tien site, established by Russian-Vietnamese Tropical Research Center (VRTC), is the first permanent long-term flux monitoring site in Vietnam, has been in operation for 3 years and is open for collaboration for widening of research in area of tropical forest ecosystems.

This seminar was the first introduction to Vietnam with AsiaFlux community, and we look forward to establish closer collaborations
with Vietnamese authorities and other countries.

Acknowledgements

We would like to give our utmost gratitude to the members of local organizing committee for their support: Dr. Nobuko Saigusa (National Institute for Environmental Studies (NIES), Japan), Nguyen Van Dien (Cat Tien National Park, Vietnam) and Dr. Nguyen Dang Hoi (Institute for Tropical Ecology, VRTC, Vietnam).

Also, many thanks go to the head of the project, Dr. Akira Miyata (National Institute for Agro-Environmental Sciences (NIAES), Japan) who has created a great opportunity for exchange and sharing of scientific. We specially thank the AsiaFlux secretary, MSc. Sawako Tanaka (NIES, Japan), who supported and encouraged us about articles, plans and giving other useful information.
We express warm thanks to Dr. George Burba and Dr. Israel Begashaw (Li-Cor Inc.) who gave the permission to use all required equipment and the necessary materials to complete the training course as well as their technical support and guidance. Furthermore we sincerely appreciate those who submitted their articles even though they have been busy for their own research and work. Last but not least, a special thanks goes to our team: Dao Thu Huong, Manh Vus, Do Phong Luu, and other staff of VRTC and Cat Tien National Park who help us to assemble the parts and gave suggestion about the Seminar and Training course.

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Fig. 3. Field excursion

Reflections from Thai Young Researchers on Participating in the AsiaFlux Training Courses

1. Monitoring net ecosystem-scale fluxes with eddy covariance and profile measurements on 18-23 August 2014 at International Rice Research Institute (IRRI), Los Baños, Philippines

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[1]School of Energy and Environment, University of Phayao (UP), Phayao, Thailand, [2]Department of Horticulture, Faculty of Agriculture, Kasetsart University (KU), Bangkok, Thailand)

Watcharapong: I was selected from AsiaFlux Committees for attending the 2014 AsiaFlux Training Course. The objective of fellowship was to provide an opportunity for the young students and scientists in Asia who are interested in flux measurements. I was very excited and happy to be one of those selected. Together with me, several ThaiFlux members also joined this event and presented papers; 1) Energy fluxes in dry dipterocarp forest, Thailand 2) Introduction to new ThaiFlux site: Dry dipterocarp forest flux Phayao site (DPT) and 3) Carbon and water flux measurements of young rubber ecosystem in north-eastern region of Thailand. We have learnt about several major topics on flux measuremetns and have had opportunity for sharing ideas with professionals. Young Thai participants are excited to have new opportunity to expand our study in a Thai forest (DPT) and to include such measurements in the future under the ThaiFlux network and AsiaFlux network.

Fig. 1. At IRRI

Throughout the training course in day 1, we have learned about theoretical introduction to micrometeorology and flux measurements. This is very important aspects and considered the principle of turbulence and eddy covariance technique, storage, advection and instrumentation. In day 2 we have learned a lot about loggernet (CR1000) introduction, instrumentation such as open path eddy covariance system: IRGASON components and setup, closed path eddy covariance system: CPEC200 components and setup, water and CO_2 profiling system: AP200 components and setup including hand on presented by Campbell scientific. This made us realized the needs to understand this subject thoroughly for the correct flux measurement. This was the first time for some of us and was a good chance to learn from senior scientists, we will make more efforts and take more courses in order to improve our understanding about flux measurement and so on.

Fig. 2. Training course and poster presentation

During field excursion to IRRI experiment, all Thai participants visited the fields where the flux measurements by automatic close chamber and the new CH_4 flux measurement system (open path CH_4 analyzer) in upland and lowland paddy field were in operation. We also realized that this may be something we could have back in Thailand and we hope to contribute to its advancement in the future. In conclusion, participations in the training course and the conference events have provided young Thai participants with a lot of knowledge and involved them in the young scientists network, which is very important for our future works with fluxes community in Asia and in the world.

Finally, we would like to thank the AsiaFlux Committees for giving us this good opportunity to learn and improve our knowledge on the science of flux measurements, and special thank to Dr. Akira Miyata, Dr. Shenggong Li, Dr. Nobuko Saigusa ,Chair and Vice-Chairs of AsiaFlux and Dr. Reiner Wassmann, Dr. Ma Carmelita Alberto and Sawako Tanaka, the local organization to support everything. Without such supports, we would not be able to participate in this training and would miss such important experiences in our research life.

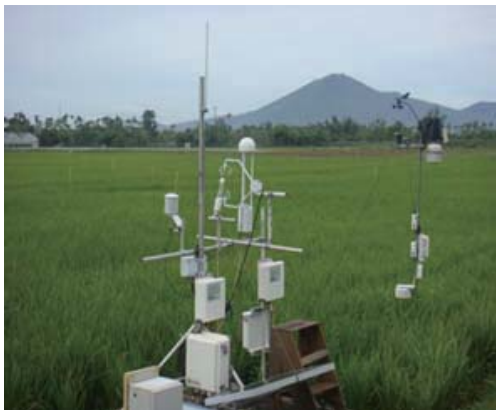

Fig. 3. IRRI Flux site

2. Tropical Forest Ecosystem Monitoring , 1-5 December 2014, National Park Cat Tien, Vietnam

Rungnapa Kaewthongrach

The Joint Graduate School of Energy and Environment, King's Mongkut University of Technology Thonburi, Bangkok, Thailand.

This was my first time joining in AsiaFlux training and seminar. I was impressed especially when I had opportunity to learn directly with the renounced experts in eddy covariance, who I had never thought to meet them in person (such as George Burba and Israel Begashow). I have learned a lot on installing and maintaining the instruments and I will apply such knowledge to my own study. Moreover, I have got many nice friends with whom I had opportunity to share ideas. From such activities, I have got many valuable suggestions which relate to my research. This seminar also inspires me to create and improve my own experiments. For example, the modified float equipment for estimating the greenhouse gas at mangrove forests in Vietnam is quite interesting and inspiring. In addition, at Cat Tien National Park the measurements of CO_2 concentration at various levels from inside canopy to above canopy at the height of 59 meters, and the soil respiration measurement with automatic chamber and the manual methods are quite interesting and provide very good examples for setting up the experiment to answer complex scientific questions in tropical forest.

Fig. 4. At Cat Tien National Park

I would like to thank AsiaFlux and local organizers for arranging such excellent training (content and atmosphere).

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Overview of Asiaflux-2015

S. Chakraborty, Pramit Kumar Deb Burman

Indian Institute of Tropical Meteorology, Pune, India

The joint conference on the Asiaflux-2015 Workshop entitled "Challenges and Significance of Ecosystem Research in Asia to Better Understand Climate Change" and ISPRS (International Society for Photogrammetry and Remote Sensing), TC WG VIII/3: Weather, Atmopshere and Climate Studies was held at Indian Institute of Tropical Meteorology (IITM), Pune, India during Nov 22-29, 2015. About 100 Indian and 50 delegates from several other countries attended this mega event. The main aim of this event was to discuss the above mentioned subject by bringing together the experts in the fields of micrometeorological, ecological observations and in allied disciplines in order to develop collaborative researches on carbon, water and energy fluxes in key ecosystems in Asia. One of the main components of the Workshop was a comprehensive training on Eddy Covariance, held during 22-24 November. Dr. Liukang Xu, Licor Bioscience taught the theoretical aspects of the Eddy Covariance system. He also explained the post processing of EC data and demonstrated how to calculate the fluxes. Dr. James Kathilankal, Licor Bioscience conducted hands on session and demonstrated sensor installation on a mobile tower.

To calculate the flux data the use of Eddy-Pro software was also discussed. The training program ended with a stimulated lecture delivered by Prof. Joon Kim of Seoul National University. About 55 participants attended the training program.

Figure-1: Picture from training course

The main workshop was inaugurated on 25th Nov 2015. Dr. V.K. Dadhwal, (Figure-2) Director, National Remote Sensing Centre, Hyderabad, India was the Chief Guest on the occasion and Prof. Akira Miyata, Chair, Asiaflux was the Guest of Honour.

Figure-2: Ceremonial inauguration of the Asiaflux-2015 Workshop; (from left) Dr. Rajeevan, Director, IITM, Prof. Miyata, Chair, Asiaflux and Dr. Dadhwal, Director, NRSC, Hyderabad.

The post lunch session on this day dealt with the role of climate, carbon cycle and human activities in tropical ecosystems. Eight speakers spoke about different aspects of large scale eco-system changes, tower measurement of turbulent quantities, carbon dynamics of Asian tropical forests, impact of land use changes on soil greenhouse gas fluxes etc. The first day of the deliberations ended with a banquet dinner arranged in a city hotel, the Courtyard Marriott, Hinjewadi, Pune. The next day (26th Nov) session started with an invited lecture by Dr. John Grace who explained the concept of soil-plant-atmosphere continuum. The post lunch session started with another invited lecture delivered by Dr. Kyaw Paw U who presented an overview of micro-meterological measurements, modelling, and trace gas exchange from ecosystems on a global perspective. Two important events held in this evening were the Young Scientist Meeting (YSM) and the SSC meeting. In the YSM several young scientists and early career scientists had an interactive session with the veteran scientists, such as Prof. Sashi Verma, Prof. Paw U, Prof. Atul Jain, Prof. Prabir Patra and Prof. A. Karipot.

Figure-3: Picture with all participants

Figure-4. A young scientist is displaying their posters.

The 3rd day of the Workshop started with a brilliant presentation made by an invited speaker, Dr. Nick Hewitt, who spoke on the effects of large scale land use changes on local air quality. After the tea break Dr. Stephen Sitch presented another invited lecture on Changes in atmospheric composition and land-atmospheric interactions across the Asian region. The post lunch session started with an invited lecture delivered by Dr. Tazu Saeki who explained the CO_2 flux estimation by top-down approach over Asian region. The last presentation was made by Dr. Prabir Patra on the application of inverse modelling in estimating methane emission in Asia. The session concluded with discussion and presentation of various awards and mementos to the participants.

Poster Session:

A total of 52 posters were presented on 25th and 26th Nov on a variety of topics ranging from flux ecosystem exchange to climate change impacts. Chowdhuri et al. presented a poster that focussed on the coherent structures responsible for the transport of scalars like CO_2 and water-vapor from close to the ground where the sources/sinks are usually located. This presentation got the best poster award (Figure –4 right)

The Asiaflux-2015 Workshop was attended by several business houses who demonstrated their products and equipments (Figure-5). These are LICOR Bioscience, The Skye Instruments, Picarro, Kipp & Zonen, Campbell Scientific, Senteck and Gill.

Figure-5. Business Display

The Asiflux-2015 Workshop delegates participated in various excursion programmes arranged on 28th and 29th November. Firstly a local trip was arranged to visit the popular places and monuments at Pune. The second trip was to a hill station, Mahabaleswar- about 120 km from Pune. The participants visited the High Altitude Cloud Physics Laboratory at Mahabaleswar, a high end laboratory of IITM dedicated to unravel the mysteries of clouds in causing precipitation. The third trip comprised a 2-day visit to Ajanta and Illora depicting ancient Indian sculpture and cave architecture.

Acknowledgments: The Asiaflux-2015 Workshop was sponsored by NIAES, NIES, APN, LICOR, ISRO & IITM. IITM, Pune hosted the events and its Director arranged a special dinner. Several people from the IITM administration provided administrative and logistic support. We thank the Security Officer, IITM for making various arrangement and security protocols.

Summary report of AsiaFlux mini-workshop on remote sensing and ecological/ environmental monitoring
2-4 March, 2016, National Taiwan University, Taiwan

Ke Sheng Cheng

National Taiwan University

Over the last two decades, various methods have been developed for monitoring of greenhouse gasses. A number of studies, using different sources of data, have also been conducted to better understand the spatial and temporal distributions of greenhouse gases. Remote sensing data acquired by earth observation satellites have proven to provide useful data for characterizing greenhouse gases distributions. In particular, the Greenhouse Gases Observing Satellite (GOSAT), the world's first earth observation satellite dedicated to greenhouse-gas monitoring, has been providing data of greenhouse-gas concentrations to research communities since 2009. On the ground level, numerous greenhouse gas flux monitoring sites have been established since late 90's. Thus, this mini-workshop aimed to bring together researchers form remote sensing community and researchers in the field of flux monitoring to introduce the characteristics of the greenhouse-gas flux data observed by flux towers and concentration data observed by remote sensing satellites, and to provide a platform for researchers from both communities to share their research experiences and findings and stimulate further collaborations and future directions of greenhouse gases monitoring studies.

The mini-workshop was held on March 2 – 4, 2016 at the Hydrotech Research Institute of the National Taiwan University. About 45 participants, including researchers from Bangladesh, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, and Taiwan, attended the mini-workshop (see Figure 1). The mini-workshop opened on March 2 with an opening address delivered by Dr. Kuo-Yen Wei, Minister of the Environmental Protection Administration of Taiwan (Figure 2). A total of 24 oral presentations were given in seven thematic sessions in the first and the second day of the mini-workshop. Topic of individual sessions are listed in Table 1.

Fig. 1. Participants of the mini-workshop.

Fig. 2. Dr. Kuo-Yen Wei delivered an opening address.

Session	Topics (number of presentations)
I	GOSAT (2)
II	Towards upscaling of ground-based fluxes – I (4)
III	Towards upscaling of ground-based fluxes – II (5)
IV	Towards upscaling of ground-based fluxes – III (3)
V	Ecological monitoring (3)
VI	Ecological monitoring (5)
VII	Estimating terrestrial carbon exchange on the global scale (2)

Table 1. Thematic sessions of the workshop

Fig. 3. Participants engages in exciting discussions.

Participants often engaged in very exciting and fruitful discussions, particularly in validating and estimating carbon fluxes from GOSAT data using inversion model and flux tower measurements and in remote sensing applications to ecological monitoring (Figure 3).Summary of major discussions and findings of individual sessions are as follows:

[Session I]

- Issues caused by different spatiotemporal scales between GOSAT & Flux sites
- How top-down based estimations of Carbon budget (GOSAT L4 etc.) can be interpreted meaningfully with bottom-up approaches (with up-scaled flux site data).

[Session II]

- Are Asian rice ecosystems really carbon neutral? (with consideration of CO_2, CH_4, other Carbon exports, etc.)

[Session III]

- The product of scaled photochemical reflectance index (SPRI) and NDVI (SPRI*NDVI) correlated with GPP with the highest significant coefficients of determination, but NDVI correlated with NEE significantly.
- The relationship between light use efficiency (LUE) and PRI in subtropical conifer forests varied with seasons, depending conditional on such factors as air humanity (VPD), soil moisture (droughts), foliar pigments, etc.
- Without the masking device, the NDVI was underestimated by 7 to 22% during the growing season in a larch forest in Japan.
- Evapotranspiration (ET) estimation based on the FAO method (ET = Kc x ET0) can be improved by incorporating a stress factor.

[Session IV]

- Inter-annual and seasonal variations in latent heat flux over the study site (Chilan Mountain forest) are dominated by different sources of precipitation, including typhoons in summer and East Asian Monsoon in autumn and winter.
- A good understanding of WUE and comparison of WUE under different habitat conditions will provide useful information for water-use and ecological management. It was also recommended to take the soil moisture content into account in calculation of the WUE.
- An automatic chamber system capable of separating the leaf-scale net assimilation rate into in situ photosynthesis and respiration rates was designed and built for field monitoring of leaf CO_2 fluxes.

[Session V/VI]

- An important session whereby GHG are being measured or quantified using both remote sensing and eddy covariance to develop management strategy for reducing GHG emission.
- It has been observed from this session that it is important to encourage inter-disciplinary research to ensure: (1) a more comprehensive research approach eg. As you increase C storage, you also need to look into the soil process of an increase in CN ratio, (2) a better understanding of the data in relation to the below ground ecosystem, and (3) not just micro-meteorologist approach for convenience but to include understanding of both above and below ground ecologist.

A field excursion was arranged on Day 3 of this mini-workshop. The field excursion was led by Prof. Cheng-I Hsieh and Professor Jehn-Yih Juang to visit a flux monitoring site of an estuary marsh grassland ecosystem in northern corner of Taipei (see Figures 4 and 5). Professor Jehn-Yih Juang, PI of the flux site, introduced his research works conducted using the observed flux data. Detailed information of the flux site is shown in Table 2.

Fig. 4. Participants of the field excursion.

Fig. 5. Participants visited the Guandu flux site.

Finally, we acknowledge the financial supports for this mini-workshop from the following institutes:
APN (Asia-Pacific Network for Global Change Research)
National Institute for Agro-Environmental Sciences (NIAES), Japan
National Institute for Environmental Studies (NIES), Japan
Chi-Sing Irrigation Association, Taiwan
Chi-Seng Water Management Research & Development Foundation, Taiwan.

Site name	Guandu Nature Park Flux Station
AsiaFlux site code	GDP
Location	Guandu Natural Park, Taipei City, Taiwan
Position	121° 28' E, 25° 07' N
Elevation	4 m above sea level
Slope	0 %
Terrain type	Grass marsh
Climate	Cfa
Mean annual air temperature	23.0 °C
Mean annual precipitation	2405.1mm
Vegetation type	Grass
Domestic species (Overstory)	Brachiaria mutica (Tower 1); Phragmites australis (Tower 2)
Canopy height	1.2m (Tower 1); 3.0m (Tower 2)
Soil type	Clay

Table 2. Site data of the Guando flux station

Feedback of Asiaflux mini workshop on remote Sensing and Ecological / Environmental monitoring held during 2-4 March, 2016 at National Taiwan University, Taiwan

Abhishek Chakraborty
National Remote Sensing Centre, Indian Space Research Organisation
Balanagar, Hyderabad

Asiaflux mini workshop on remote Sensing and Ecological / Environmental monitoring was conducted during 2-4 March, 2016 at National Taiwan University, Taiwan and I was fortunate to be a participant of that workshop. The workshop was graced by leading scientists, research scholars and industry personnels across the Asian region to discuss about the carbon and moisture fluxes over different ecosystems with special emphasis on it monitoring and modeling using satellite data. The workshop was started with special session on GOSAT satellite dedicated towards green house gas studies. Experienced scientists from NIES explained to us about the retrieval algorithms of the green house gases and also its flux calculation at global level. We were also told about the different levels of products available in the public domain for modeling purpose. Myself and my other colleagues from India shared our experiences of flux studies over forest and agri-ecosystems. Scientists and scholars from China, Taiwan, Indonesia, Malaysia, Hong Kong and Philippines shared their research experiences in ecosystem modeling and new approaches to monitor and upscale carbon and moisture fluxes. The workshop was followed by visit to flux tower established at Guandu Nature Park which is a wet land ecosystem harboring different rare species of birds and crustaceans.

I would like to convey that it was a very memorable learning experience of flux estimation, its modeling/ upscaling with mutual sharing of experiences and odds. Personally, I could meet scientists of common research interest and discussed with them about my research topics. It will definitely help me in establishing long term scientific collaboration with them. Further, I have also experienced the scientific temper of National Taiwan University and learnt about Taiwanese culture and life style. In totality, it was really a fantastic experience of cutting edge science in the field of ecological / environmental modeling. I am thankful to Asiafux for providing me the opportunity to share and discuss with my peers about my flux study. I wish Asiaflux would continue to support young scientists like me to expose them to the international community. I take this opportunity to wish every success to Asiaflux in their future endeavor.

An additional report from yourng scientist who participated in the mini-workshop in Taipei

Joining AsiaFlux for Capacity Building and Scientific Excellence in understanding Climate Change and Adaptation Strategy

Md. Golam Mahboob, *Dr. Engg.*
Agroenvironmental Remote Sensing and Modeling (ARSAM) Lab, Bangladesh
Agricultural Research Institute, Gazipur, Bangladesh

AsiaFlux is a network of scientific endeavors devoted in the observation and modeling of Green House Gases (GHG) eg. carbon-di-oxide, water vapor, and energy budget between the terrestrial ecosystem and the atmosphere across time scales in the Asian region. Understanding such scientific phenomenon is necessary for devising appropriate mitigation and adaptive strategies against the challenges we are facing in the advent of global climate change. For understanding broad spectrum of variation present in the diversified ecological processes, it is important to share information and expertise across geographic boundaries. Unfortunately, scientists and academicians in the developing nations are often deprived of having adequate resources and capacity to carry out such research program despite the presence of vital necessity. Being one of the worst possible victim countries to climate change phenomenon, research on GHG budget through continuous GHG Flux observation is critical to Bangladesh. However, such research activities in Bangladesh is mostly limited to the Mymensingh Flux Study Site installed in a rice based agroecosystem. Any remote sensing study for extrapolation of field/tower based GHG Flux observation and/or retrieval of essential parameters from satellite data is yet to be reported from Bangladesh. Continuing support to young researchers and graduate students from Bangladesh and/or other developing nations to participate in the AsiaFlux conferences, training and workshops may overcome such limitations and open up the vast opportunities to build network with peers for professional collaboration and capacity building in conducting quality research observation in the representative ecosystems and modeling of GHG budget between terrestrial ecosystem and the atmosphere by using AsiaFlux sites data and satellite observation altogether.