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Contents

Overview of Asiaflux-2015

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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.

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.

Figure-5. Business Display

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

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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.

Report of Workshop on the ecosystem carbon/water cycling research in the changing climate - Challenges of carbon and water fluxes in terrestrial ecosystems: Ecophysiological and micro-meteorological understandings and their perspectives in current and future environmental sciences under climate change

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[2]National Institute for Environmental Studies

˝Workshop on the ecosystem carbon/water cycling research in the changing climate - Challenges of carbon and water fluxes in terrestrial ecosystems: Ecophysiological and micrometeorological understandings and their perspectives in current and future environmental sciences under climate change" was held in April 23-25, 2015 at NIES (National Institute for Environmental Studies), Tsukuba, Japan, under the support by AsiaFlux; River Basin Research Center, Gifu University; Center for Global Environmental Research, NIES; JaLTER; Japan Society for the Promotion of Science; Korea University, BK21Plus Eco-Leader Education Center (ELEC); and Ecological Research Seminar. The aim of this workshop was to share the knowledge on the functional roles of carbon and water in our terrestrial ecosystems, together with its scientific and societal importance as well as the tasks that the scientists would tackle. The workshop contained (1) series of lectures on the history of carbon/water cycle research, and recent challenges in ecosystem sciences for understanding the predicting the ecosystem functions and their societal services (the 11 special lectures was given by 9 expert scientists; Table 1), (2) oral presentations by young scientists, and (3) group discussion by all participants. The 56 participants from nine countries took part in the workshop (Figure 1).

The workshop opened on April 23, 2015 with the welcome messages and introduction of overall picture of the workshop by Dr. Noda, Co-Chair of the workshop. In the early afternoon on the first day, Prof. Tenhunen (University of Bayreuth), Prof. Kumagai (Nagoya University) and Prof. Muraoka (Gifu University) gave three lectures. In the late afternoon, all participants had one-minute speeches to introduce themselves, their studies, and participation motivation. After daytime session, almost all participants took part in the welcome party which offered a good opportunity to be acquainted with other participants. On the second day, after three lectures by Prof. Tenhunen, Prof. Lee (Korea University) and Dr. Ito (NIES), the results of individual studies were presented by five young scientists and students: Narumi Tahara (Osaka Prefecture University, Japan), Wei Xue (University of Bayreuth, Germany), Mioko Ataka (Kyoto University, Japan), Joyeeta Singh (Forest Research Institute, India), and Nilendu Singh (Wadia Institute of Himalayan Geology, India) (see Singh and Singh (2015) in this AsiaFlux Newsletters for detailed information). In the late afternoon, two lectures were given by Prof. Wang (Shizuoka University) and Dr. Yamagata (NIES) and group discussion was carried out. The themes of group discussion were as follows: (1) what are major tasks and questions concerning the current climate change ?; (2) what will be their challenging tasks

Figure 1: Participants of the workshop

and role in near-future environmental sciences?; and (3) how do we navigate such scientific efforts and outcomes to our societal systems or stakeholders? In the morning on the final day, each group reported the results of the group discussion. After the reports, three lectures were given by Prof. Hikosaka (Tohoku University), Prof. Tenhunen and Dr. Saigusa (NIES). The workshop was successfully closed on April 25, 2015 with the closing remarks and giving "Certificate of Participation" for all participants by Prof. Muraoka, Co-Chair of the workshop.

During the workshop, we had been impressed by young scientists who aggressively asked questions and attended the debate. We hope the workshop will help participants to produce seeds of their new studies and to create new collaborative studies in near future. Finally, we greatly thank Prof. Tenhunen and all lecturers who introduced us to the frontier researches on the functional roles of carbon and water in our terrestrial ecosystems, together with their scientific and societal importance.

Reference:

Singh and Singh (2015) The report of participation in the workshop: 'Ecosystem carbon/water cycling research in the changing climate', 23-25 April, NIES, Tsukuba, Japan 'Challenges of carbon and water fluxes in terrestrial ecosystems: Ecophysiological and micrometeorological understandings and their perspectives in current and future environmental sciences under climate change', AsiaFlux Newsletter, 39 (This issue)

John D. Tenhunen (Univ. of Bayreuth, Germany)	Evolution of the Earth's carbon cycle: 4.5 Gyr B.P. – 360 Ma B.P."
	Global change, the carbon cycle, and evolution of the biosphere: 360 Ma – 2.58 Ma B.P.
	Global change disturbance of the biosphere from the Quarternary to the Anthropocene
Tomo'omi Kumagai (Nagoya Univ., Japan)	Ecohydrology: interaction between water and carbon cycles
Hiroyuki Muraoka (Gifu Univ., Japan)	Satellite Ecology: measurements of photosynthesis by leaf ecophysiology and satellite remote sensing
Woo-Kyun Lee (Korea Univ., Korea)	Spatio-temporal estimation of carbon budget using terrestrial and remote sensing data in Korea
Akihiko Ito (NIES, Japan)	Global modeling of carbon and water cycles
Quan Wang (Shizuoka Univ., Japan)	Seasonal variation in V_{cmax} and its retrieval from vegetation indices
Kouki Hikosaka (Tohoku Univ., Japan)	Ecophysiology and optimality in canopy photosynthesis
Nobuko Saigusa (NIES, Japan)	Challenges in changing environmental sciences
Yoshiki Yamagata (NIES, Japan)	Overview of GCP activities

Table 1: Lecture list

The report of participation in the workshop: 'Ecosystem carbon/ water cycling research in the changing climate', 23-25 April 2015, NIES, Tsukuba, Japan

Nilendu Singh[1], Joyeeta Singh[2]

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The introduction to our studies and the participation motivation

Himalaya exchanges vast amounts of carbon, water and energy with the atmosphere and is fundamental in controlling local-regional climate. The rarity of energy-water-carbon exchange studies in changing biophysical environment is a matter of global concern. To understand the seasonal dynamics and coupling mechanism between these fluxes in the mid-altitudinal coniferous vegetation, we are involved in systematic and concurrent measurements of micrometeorological variables and ecophysiological characteristics within a uniformly distributed pine (Pinus roxburghii) forest ecosystem. A thorough characterization of these exchange processes was initiated in January 2010 in the reserve forest at Forest Research Institute, Doon valley, India as part of the ISRO / SAC 'Energy and Mass Exchange in Vegetative Systems' (ISRO-Geosphere Biosphere Programme) (Fig.1). Here, we are studying seasonal variations in partitioning of energy fluxes and balance, evapotranspiration and ecosystem carbon balance. We are trying to figure out the mechanisms how physical and biophysical variables are connected to energy and mass (H_2O & CO_2) fluxes in forest including the role of understory species (Singh et al. 2014a, 2014b, 2016).

This workshop was a part of collaborative research activities among scientists from Asia and other parts of the world under the framework of AsiaFlux. The aim of the workshop was to share the knowledge on the functional roles of carbon and water in our terrestrial ecosystems, together with its scientific and societal importance as well as the tasks that the scientists would tackle. This workshop facilitated greater insight into the mechanisms, dynamics and standard methodologies to quantify the strength of coupling between ecosystem carbon and water cycling. This part of the workshop was of utmost importance for us. The ecosystem carbon-water

Fig. 1. The experimental field (~5 ha) at the reserve forest of the Forest Research Institute, Dehradun (30° 20' 0" N, 78° 00' 02" E, 640 m) India.

Fig. 2. Dr. Saigusa and Joyeeta singh with fresh verdure at NIES

cycle coupling is a relatively unexplored science and it is the most important issue from the point of view of global environmental change. The objectives of the workshop were very persuasive which drove us a long way to join this meet at Japan. The aim of the workshop was rightly carved out as 'global-scale carbon and water cycle research integration for societal benefits'. The field is crucial in understanding the ecosystems and environments under the continuing global climate change.

The report of participation

The holistic picture of Earth evolution-dynamics in terms of planetary energitics, global carbon and hydrological cycle, integrated with strong global-scale case studies presented in the series of lectures by many world-renowned scientists, especially those by Prof. John D. Tenhunen (University of Bayreuth, Germany), enhanced our understanding of the Earth system functioning. Our outlook and perspective was significantly enhanced following the workshop lectures and presentations. We learned how to deal with scientific problems in a holistic and integrated-interdisciplinary way. Further, we learned many new tools and modelling techniques to model and understand ecosystem processes such as satellite ecology and ecohydrology.

The research problems addressed at this interactive workshop were very specific but of global importance at the same time. Dr. Akihiko Ito (NIES, Japan) raised the issue of global modelling of carbon and water cycle. He explained various global-scale ecosystem models, 'VISIT' model and various methodologies including isotopes, meta-analysis and space based observation tools to model global carbon-water cycle. Further, he rightly pointed out three unsolved science questions: (1) global plant photosynthesis, (2) is plants' water use efficiency increasing and (3) is plants' seasonality expanding in the scenario of global warming? Finally, he concluded that process-based models are a useful methodology for ecophysiological, biogeochemical and global change studies. He encouraged young minds to take up these interesting but unsolved science questions.

Dr. Nobuko Saigusa from NIES (Fig. 2) helped to expand our horizon on carbon cycle science and introduced us with global environmental GHGs monitoring programme of CGER/NIES. She stressed on various feasible modes and on-going global strategic environmental monitoring. She explained working of aircraft-, ship-, and dedicated GHG satellite (GOSAT)-based monitoring, especially over alpine zone, Siberia and adjacent marine environment. We learned how global scientists are working towards establishing global carbon observation and analysis system. She emphasized enhanced connection of the Asia-Pacific monitoring network with the world body. She rightly pointed out the need of standardizing the observation methods and providing data to the general public for science popularization. She pointed out that for estimating terrestrial carbon budget, inter-

disciplinary global network observations are critical and stressed the need for expanding the network and establishing more ground observation systems across the biome. New forest disturbance, biomass-monitoring methodology (space-, airbrone LiDAR) was also dealt with in her presentation. Regarding future challenges, effective capacity building and ecosystem change detection at larger temporal and spatial scale were highlighted.

The introduction on 'GLOBAL CARBON PROJECT' by Dr. Yoshiki Yamagata of CGER/NIES further substantiated that this workshop was really international in spirit but local and specific in working and perspective.

The lecture by Prof. Woo-Kyun Lee (Korea University, Korea) on 'Saptio-temporal estimation of carbon budget using terrestrial and remote sensing data' taught us the basics of carbon cycle in forests and the methodology for predicting the forest carbon budget under climate change. He explained the conceptual framework for 'Forest Carbon Account model' and its use in different assumed scenario of forest regeneration. The integrated use of remote sensing with models was best explained by successful case studies.

We learned a new term 'Satellite Ecology' from Prof. Hiroyuki Muraoka (Gifu University, Japan). He taught how to link ecosystem ecology, remote sensing, micrometeorology and modelling for studying ecosystem structure and functions in complex landscape. He explained these concepts by describing the results of Takayama super-site. Some important key concepts explained were: leaf-canopy photosynthesis, phenological dynamics and spectral vegetation indices.

The 'Ecohydrology: interaction between water and carbon cycle' dealt with by Prof. Tomo'omi Kumagai (Nagoya University, Japan) was a thought provoking lecture. He stressed that understanding of hydrology is critical for describing the ecosystems, its structure and functions in climate change scenario. The concept of deforestation – precipitation was well explained by him citing some compelling case studies from across the world.

My understanding on ecophysiology and canopy photosynthesis was further enhanced by listening to a lecture by Prof. Kouki Hikosaka (Tohoku University, Japan). He nicely explained the principles of canopy photosynthesis models and parameters that are responsible for variation in canopy photosynthesis. Prediction of canopy functions were explained by various elegant methods: empirical approach (meta-analysis of canopy traits) and theoretical approach (optimization theories for canopy traits, game theory application to canopy and photosynthesis models).

The presentations by the young scientists at this interactive meet influenced my thinking a lot about the carbon-water cycle science. Narumi Tahara from Osaka University delivered a presentation on 'change on photosynthetic capacities of early successional ecosystem after wildfires in interior Alaska'. 'Bottom-up biophysical mechanisms responsible for inter-seasonal variations of ecosystem carbon and water fluxes in rice', a fine presentation by Wei Xue (University of Bayreuth), exposed us to ecosystem processes in short canopy managed vegetation. Soil respiration processes as influenced by dryness-wetness cycle were well presented by Mioko Ataka from Kyoto University.

Finally, I want to thank the professors and scientists, especially Dr. Muraoka, Dr. Saitoh and Dr. Tenhunen who showed us, the young researchers, ways and necessity to link the ecosystem science to societal benefits. We owe a lot to the organizers and supporters of this workshop who made this interactive workshop a grand success. We humbly acknowledge the financial support provided by the Ecological Society of Japan (ESJ), under its "Ecological Research Seminar" program organized by the international journal 'Ecological Research'. This was a marvellous opportunity to learn, interact, and share our carbon-water flux research at an international platform.

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Memoirs : Dr. Ray Leuning

AsiaFlux members

Dr. Ray Luening, a Chief Research Scientist at CSIRO in Canberra, Australia passed away on February 12, 2016.

Dr. Ray was best known to for the Webb-Pearman-Leuning equation, which accounts for the effects of density fluctuations due to temperature and humidity fluctuations on CO_2 flux measurements.

Through the FLUXNET mailing list, we had sad news that Dr. Ray Leuning passed away in February. A considerable number of immediate responses to the news demonstrated how much we were disappointed and how great his contribution to the FLUXNET community was. It is also the case for AsiaFlux. From its establishment, Dr. Leuning shared his intelligence and experiences with us, and thus led us to the right direction.

Personally, I met Ray for the first time when he participated in the 50th anniversary symposium of SAMJ (the Society of Agricultural Meteorology of Japan), Tsukuba in 1992. I remember that he enthusiastically explained the density correction on a blackboard. In 1996, we had a collaborative experiment in rice paddy field in Okayama, Japan. I spent exciting two weeks in mid-summer with Ray, Dr. Tom Denmead and other participants including Drs. Joon Kim, Yoshinobu Harazono, Eiji Ohtaki, Toshihiko Maitani and Takeshi Miura. Visiting his office in Canberra is also in my pleasant memories in the 1990s. After AsiaFlux was established in 1999, Ray participated in most of our workshops and stimulated the discussion. You fostered AsiaFlux. Ray, thank you and please rest in peace. (From Akira Miyata, AsiaFlux Chair)

Photo 1. at Teshio 2009

Photo 2. young Ray (Tsukuba, 1992）

A young scientific researcher's impression of a big scientist Ray Leuning

By: Zheng-Hong Tan[1], Qing-Hai Song[2], Yi-Ping Zhang[2]
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Big scientist plays critical role in science advancements. When someone talks physics, the name of Newton and Einstein will easily come to their mind and words. In the field of ecophysiology and micrometeorology, Ray Leuning is one of this kind of big scientists. He was best known for developing the WPL correction and Leuning stomatal model. This kind and generous man with peaceful smiles had left us permanently.

I am an ecology background student. When I moved to Chinese Academy of Science for my PhD, I was asked to study micrometeorology and carbon fluxes with the specific tool eddy covariance technique. I started to learn the basic knowledge in this new field. The name Ray Leuning came to me in a classic technique paper which he coauthored with Webb and Penman. The ChinaFLUX organized a training course on eddy flux in 2006. Ray was one of the key lecturers in this training course. It was my first meet with Ray. He was a tall, thin and white hair old gentleman. His profound knowledge and easy understood English inspired me into this new field. After that training course, I felt much easier reading the handbook of micrometeorology edit by Xuhui Lee. This book was the most important eddy covariance reference book at that time.

Ray visited to China again for the AsiaFLUX workshop in 2010. When I heard the news, I immediately discussed with my boss the idea of hosting Ray's visit to Kunming and Xishuangbanna. I wrote to Ray and received his favorable reply which cc to Dr. Ying-Ping Wang immediately.

Ray gave a talk in Kunming. The talk was organized with two themes: 'Scaling land-atmosphere interactions from leaves to continents' and 'A personal journey through ecophysiology, micrometeorology, hydrology and land surface modeling'. My senior fellow apprentice Dr. Qing-Hai Song was fascinated in studying leaf and canopy temperature at that time. Ray gave him lots of suggestions from the leaf energy balance perspective. Qing-Hai didn't like math and equations. Ray encouraged and consoled him. Ray explained, 'No need advanced mathematic knowledge in ecophysiology and micrometeorology studies, but basic ones is necessary'. I read Ray's paper and agreed this statement well.

My third time meet with Ray was in Seoul, Korea. He sat in the back row of the meeting room in the coffee break. I walked to him and had an in-depth discussion with him. I saw some tired appearance on his face. Several months later, I was noticed that he was diagnosed with cancer. Ray's remark on model and experiment in that talk had a strong impact on my following way of think. He said, 'If we could easily simulate a process, no need to set experiment on it anymore'. I think this is true for us especially for the experimental scientists.

Ray replied to my invitation on Jan 23, 2016 that he could no longer travel and conduct research work anymore. I am now a university teacher and wish Ray could give some classes for the university students when I wrote the invitation. However, it became the last letter from him to me.

As a young scientific researcher, I was very fortunate to meet Ray when I entered the eddy flux research field. I would like to write these words and post these pictures to show my respects to Ray.

Looking back in 1996, as a nervous foreign scientist from Korea, I was under extreme tension during my first encounter with Ray Leuning in a collaborative international research in Okayama, Japan (this is the rice field study that our chair, Dr. Miyata mentioned, i.e. IREX1996). I learned a humble lesson from Ray that science is an art of storytelling with insight and foresight based on hindsight. The next 20 years with Ray is history. Having a good mentor early in our career can mean the difference between success and failure, or success and significance. The greatest privilege of impacting the future is to build into another person's life. Ray made himself available, took the initiative, and served as a model in AsiaFlux. He always reminded us of the fundamental, i.e. "*Know thy site!*" It is said, "*When the oak is felled the whole forest echoes with it fall, but a hundred acorns are sown in silence by an unnoticed breeze*." Thank you, Ray! The hopes and dreams you have planted in the fertile soil of AsiaFlux will continue to bring out fullness of joy and thanksgiving of rich fellowship and services to make the world more beautiful and meaningful. May the LORD bless you and embrace you in His grace and peace! With a grateful heart and love, Joon Kim

Photo 3. at Workshop in Japan 2009

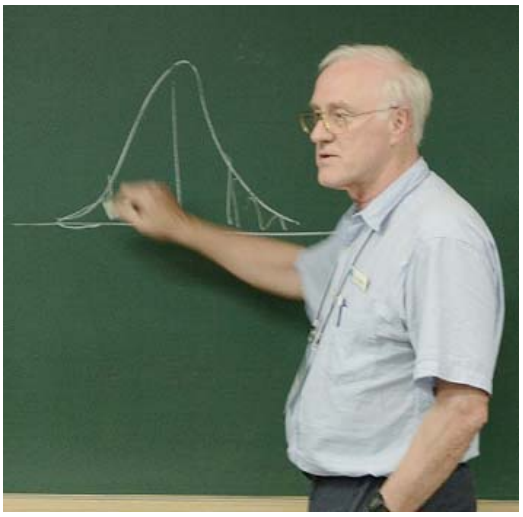

Photo 4. at Workshop in Korea 2011

From Editor

This issue of AsiaFlux News Letter includes reports of recent workshops organized by AsiaFlux and other affiliated institutes. These reports demonstrate the vibrant research activities conducted by AsiaFlux and its members. The last two articles in this issue are in memory of Dr. Ray Leuning, a great leader in flux monitoring and long-time supporter of the AsiaFlux, by two members of AsiaFlux.

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