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Contents

Report of the International Workshop on the Isotope Effects in Evaporation

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An International Workshop on the Isotope Effects in Evaporation titled as *Revisiting the Craig-Gordon Model Four Decades after its Formulation* was held on 3-6 May 2006, at the Auditorium of Area della Ricerca del CNR, Pisa, Italy. The aim of the workshop was to re-examine the Craig-Gordon evaporation model and review current knowledge of isotope fractionations occurring during phase changes of water in natural environments and laboratory experiments. A brief review of the workshop and subjects that were discussed at the meeting is presented in this report.

Evaporation is an important energy exchange process between Earth's surface and the atmosphere. Although it is a subject that has attracted mostly atmospheric scientists, there is another group of researchers who have been exploring this important energy and material exchange process. Scientists in geochemistry and hydrology have been utilizing a quantitative tool to describe the evaporation process on the basis of variation in isotope ratios of $^{2}H/^{1}H$ and $^{18}O/^{16}O$ associated with the phase change of water. It is known as the 'Craig-Gordon evaporation model' that was formulated four decades ago by Prof. Harmon Craig (1926-2003). He began his work on the model during his sabbatical leave in 1963-64 at the Laboratory for Nuclear Geology of the University of Pisa. The model, co-authored with Louis I. Gordon, was presented at the Workshop on Stable Isotopes in Oceanographic Studies and Paleotemperatures held in Spoleto, Italy, in July 1965, and published in the proceedings of the meeting, opening a new era for isotope hydrology.

The workshop was held to commemorate Harmon Craig, at the very place where he formulated his monumental achievement, with over 100 participants, including Louis Gordon who co-authored 'Craig-Gordon Model'. During three days of intensive workshops, invited and voluntary oral presentations and posters were presented on a variety of

traditional and emerging topics in isotope hydrology. Subjects discussed at the workshop were (but not limited to) as follows.

- Application of Craig-Gordon Model in natural and experimental settings of evaporation,
- Stable isotope composition of water in elucidating hydrologic budget,
- Isotopes in air vapor and atmospheric water cycles,
- Isotopic composition of precipitation and its implication for paleoclimate studies,
- Evaporation of soil water,
- Evapotranspiration by plants,
- Mass independent fractionation of ^{17}O,
- Isotopes and global scale hydrological modeling.

The conceptual basis of Craig-Gordon model was discussed in detail at the beginning of the workshop. Researchers presented uncertainties, limitations of the model with possible explanations and future direction of the model improvement. Reviews and recent progresses were also presented for traditional subjects such as lake evaporation, water budget of terrestrial water bodies, isotopic composition of precipitation, paleoclimatic study based on oxygen and hydrogen isotopes from various proxy indicators. Evapotranspiration received increasing attention with respect to material and energy exchanges in atmosphere-plant-soil continuum. The Craig-Gordon model was applied to explain isotopic enrichment occurring in internal space of leaves and a more practical application of leaf oxygen isotope composition has been suggested. The importance of water vapor was emphasized as a missing link for global water cycles and the necessity of a global network for vapor sampling and analysis was proposed. Use of mass independent fractionation of ^{17}O as a new tracer for hydrological cycle received ardent attention from most participants.

Because the meeting was the first one of this kind ever held, unparalleled enthusiasm seized the auditorium as the long debating topics were discussed by senior scientists and novel ideas were presented by young, motivated scientists. Meeting and talking with preeminent scholars who wrote the history of isotope hydrology by establishing concepts and techniques was an unforgettable pleasure for all participants. Moreover, participants were delighted to receive an unexpected gift, i.e., an original copy of the 'Craig and Gordon (1965)*' paper that is notorious for its scarcity and difficulty in obtaining. The richness of exciting discussion exchanged at the workshop suggests that the science behind isotope hydrology should progress with the help of open discussion that is fully demonstrated by this meeting.

*H. Craig an L.I. Gordon: Deuterium and oxygen-18 variations in the ocean and the marine atmosphere. In Stable Isotopes in Oceanographic Studies and Paleotemperatures (E. Tongiorgi, Editor), pag. 1-130. CNR-Laboratorio di Geologia Nucleare, Pisa, 1965.

A Role of Coarse Woody Debris in Forest Carbon Cycle

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1. Introduction

Coarse woody debris (CWD) is an important component of all forest ecosystems. CWD influences carbon storage, nutrient and water cycles, maintaining biodiversity and serves as a habitat for forest organisms (e.g. Harmon *et al*., 1986, Krankina *et al*., 2002). Recent studies analyzed the amount, structure, and dynamics of CWD in natural and managed forest (e.g. Siitonen *et al*., 2000; Busing 2005). CWD dynamics affects long-term forest carbon cycling (Harmon *et al*. 1986; Janisch and Harmon 2002). However, CWD have generally not been quantified in the carbon budgets in forest ecosystems. CWD is an important respiratory source of carbon through decomposition processes in forest (Bond-Lamberty *et al*., 2003). Thus, more accurate estimate of the amount of CWD and decomposition rate will help to evaluate forest NEP and understand long-term forest carbon cycle.

I have measured decomposition rate of CWD as CWD respiration rate (R_{CWD}) at a temperate broad-leaved secondary forest and a boreal coniferous natural forest and evaluated the role of CWD in a carbon cycle in forest ecosystem.

2. Site description

Yamashiro Experimental Forest (YMS, 34°47'N, 135°50'E, Kyoto, Japan, Figure 1a)

It is a secondary deciduous broad-leaved forest dominated by such as *Quercus serrata* and *Irex pedunculosa*. The area became dominated by *Pinus densiflora*. However, about 30 years before our study, pine wilt disease spread in the area; most of the *Pinus densiflora* died, and broad-leaved species took their place. *Pinus densiflora* dead wood, both standing and downed, is abundant in the forest. The stand density is 3209 ha^{-1}, the mean crown height is about 12 m, and the living biomass (DBH>=3 cm) is 44.54 tC ha^{-1} (Goto *et al*., 2003). The annual mean air temperature is 15.5 °C and annual precipitation is 1449 mm. The forest soil is poorly developed sandy weathered granite with thin O and A layers.

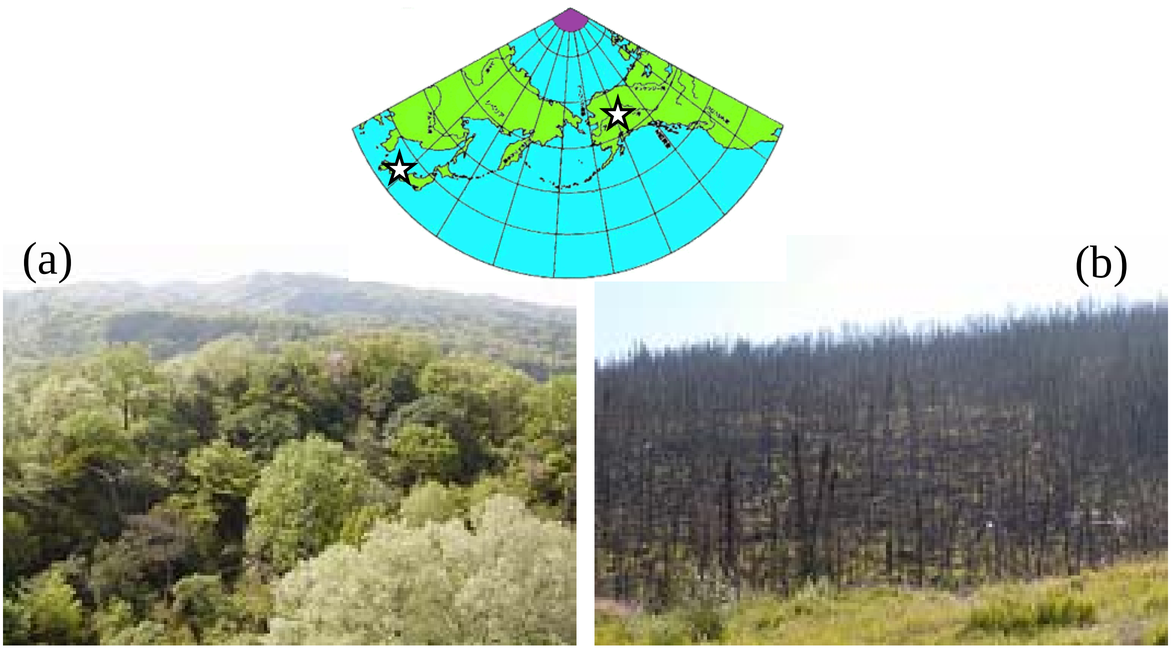

Figure 1. View of Yamashiro Experimental Forest (YMS, a) and Poker Flat Research Range (PFR, b).

Poker Flat Research Range (PFR, 65°07'N, 147°27'E, Northeast of Fairbanks, Alaska, U.S.A., Figure 1b).

It was a boreal coniferous natural forest that was severely burned by the wildfire in 2004. *Picea mariana* (black spruce) was dominated before the disturbance. There are no living trees and *Picea mariana* dead wood, both standing and downed, is abundant in this area in 2005. Dead wood stand density is 2628 ha^{-1} and the dead wood amount is 7.0 t ha^{-1} (Jomura and Dannnoura 2006). The annual mean air temperature is –3.4 °C and annual precipitation is 269 mm at Fairbanks. Burned moss layer covers the forest soil surface.

3. CWD respiration measurement using automated chamber system at YMS

To clarify the environmental controls on R_{CWD}, we designed an automated chamber system and conducted continuous monitoring of R_{CWD} at YMS. We quantified the effect of environmental controls on R_{CWD} and evaluated the empirical model.

The CO_2 flux from 2 CWD samples of *Pinus densiflora* and *Quercus serrata* was measured using the system for two years from 2002 to 2003. This automated chamber was designed to open and close the top of chamber (Figure 2a), thus CWD allowed normal drying and wetting between measurements. Fluxes were measured for 10 minutes in every 20 minutes by circulating air through the chamber and infrared gas analyzer (IRGA, LI-800, Licor). Temperature and water content of CWD samples were measured by thermo couple and time domain reflectometry (TDR). Samples selected from CWD on the forest floor.

R_{CWD} of 2 samples showed clear diurnal changes that followed the daily change in surface temperature of CWD. In the short-term, R_{CWD} decreased sharply with increasing water content during rain events and then increased slowly after rain events (Jomura *et al*. 2005a). In the long-term, R_{CWD} increased exponentially with temperature and the R_{CWD} in summer was about eight times greater than that in winter (Figure 2b). The variation in R_{CWD} at the same temperature was caused by the variation in the water content owing to rain events. An exponential function using temperature and a quadratic function using water content explained 85 and 88 % of the variance in R_{CWD} of *Quercus serrata* and *Pinus densiflora,* respectively, and reproduced the long-term changes in R_{CWD} caused by temperature and the short-term changes in R_{CWD} caused by water content. R_{CWD} showed diurnal, short-term, and seasonal changes with the temporal trends in temperature and water content.

a)

b)

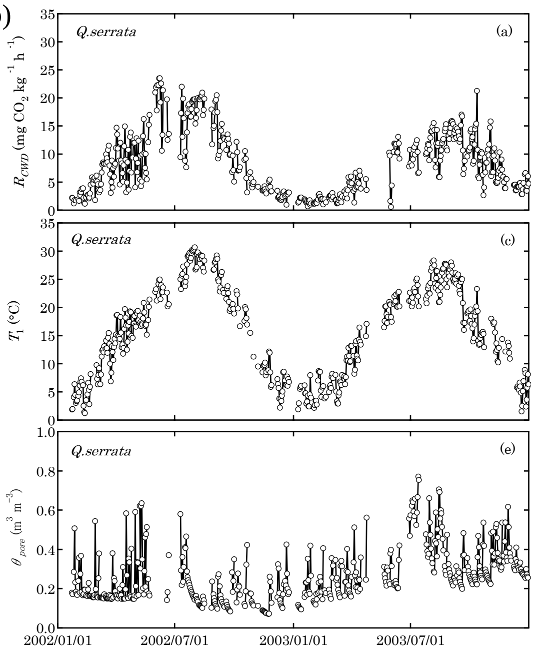

Figure 2. Automatic operated measurement system (a) and the seasonal changes in CWD respiration (RCWD), temperature (TCWD), and water content of CWD (θpore).

4. CWD respiration measurement using manual operated chamber system at YMS

To evaluate the effect of CWD characteristics on the variation in R_{CWD}, we measured CO_2 flux from many of CWD samples with various size and wood density.

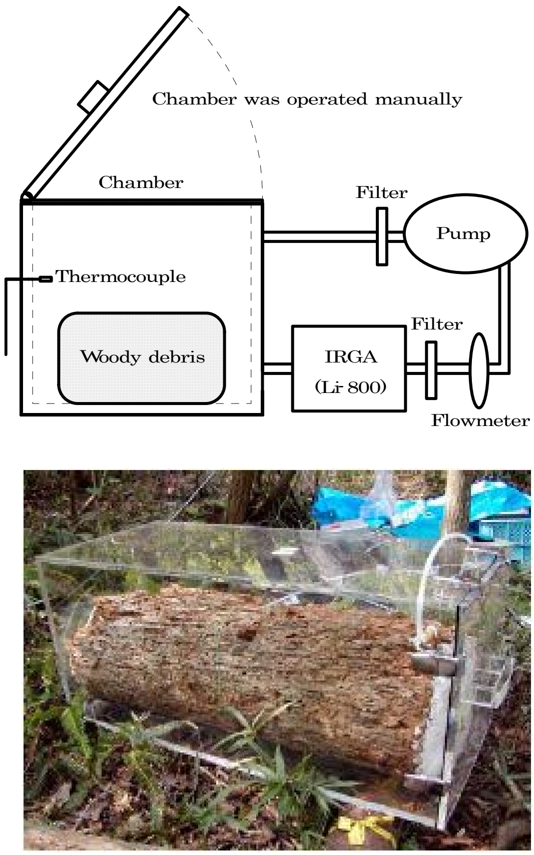

Figure 3. Manual operated measurement system

We obtained 91 samples from snags and logs at YMS, using a hand saw or chain saw. To eliminate emission of CO_2 from the cut sample surfaces or microbial invasion into them, we sealed the cut surfaces with silicone sealant. The CO_2 flux measurement system was composed of an IRGA (Li800, Licor) and a chamber (Figure 3). The samples were set in this chamber and CO_2 flux was measured from the difference of the CO_2 concentration in the chamber for 5 minutes and calculated R_{CWD} per dry weight of sample. Temperature in the chamber was measured by using the thermo couple. The relationships between R_{CWD} and temperature in the chamber (T_c), water content of the CWD (θ_{pore}: volumetric water content on the basis of the volume of voids in the CWD), and other CWD characteristics (diameter: D, wood density: ρ) were determined.

R_{CWD} varied considerably, from 0.1 to 148.6 mg CO_2 kg^{-1} h^{-1}. R_{CWD} increased exponentially in response to increasing temperature, similar to many previous respiration results (e.g., Kirschbaum, 1995). R_{CWD} was low when θ_{pore} was either low or high, but it was high at intermediate values of θ_{pore}. Moreover, R_{CWD} decreased exponentially as diameter increased, and also decreased linearly with increasing wood density. These variations in R_{CWD} in relation to changes in T_c, θ_{pore}, D and ρ can be described by the following function:

$$R_{CWD} = 0.468 \exp(0.045 T_c)(\theta_{pore} + 0.073) \cdot (0.867 - \theta_{pore})^{0.551}(-7.131 \log D + 28.096) \cdot (-20.177\rho + 15.670)$$

$$r^2 = 0.54$$

The respiration of both snag and log samples varied similarly with water content, but the range in water content clearly differed between snag and log samples.

5. Spatial variation in the decomposition rate of CWD at YMS

To examine the spatial variation in the decomposition rate of CWD, we measured decay rates of block specimens of *Pinus densiflora* by examining the weight loss rates for two vertical positions (above and on the surface of the forest floor) and three locations along a slope (ridge, slope, and valley).

Decay-rate constants based on the single-exponential decay model ranged considerably, from 0.004 to 0.316 yr^{-1} (Jomura *et al.*, 2005b). Decay-rate constants at the surface were significantly larger than above the

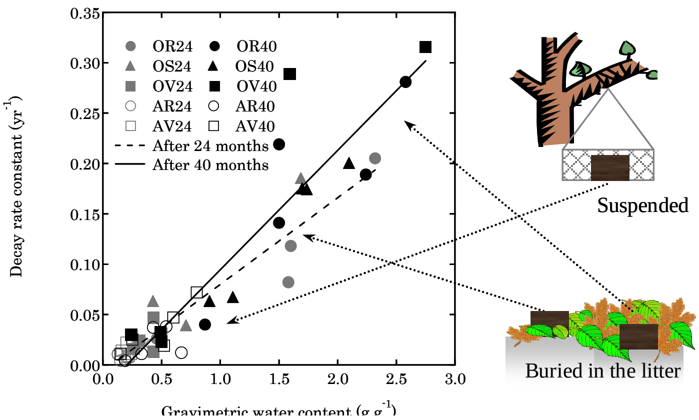

Figure 4. Relationship between decay-rate constant and gravimetric water content of the block specimens

surface however decay-rate constants was not significantly different among locations. Decay-rate constants had linear relation to water content of block specimens (Figure 4). Limited contact with the ground caused the lower water content of the specimens. The depth of the litter layer contributed to the variation in the water content of the specimens placed on the ground due to the subtle concavo-convex nature of the ground surface around the specimens. The change of the characteristics of the specimens by decomposition progress would cause the variation in water content of specimens. Therefore, to quantify the spatial variation in the decay rate of CWD in forest ecosystems, the spatial variation in water content caused by differences in the environmental conditions around the CWD, such as contact with soil and depth of the litter layer, and CWD characteristics changed through decomposition progress should be considered.

6. Evaluation of the carbon budget of CWD at YMS

On the basis of a field survey conducted in 2003, the mass of CWD was estimated at 9.30 tC ha^{-1}, with snags amounting to 60% of the total mass (Figure 5). Mean annual CWD input mass was estimated to be 0.61 tC ha^{-1} y^{-1} by monitoring tree mortality in the forest from 1999 to 2004. By scaling the measured R_{CWD} to the landscape lebel, we estimated that the annual R_{CWD} in the forest in 2003 was 0.50 tC ha^{-1} y^{-1} or 10%-16% of the total heterotrophic respiration. Therefore, 0.11 tC ha^{-1} y^{-1} or 7% of the forest NEP was sequestered by CWD. In a young forest, in which CWD input and decomposition are not balanced, the CWD carbon budget needs to be quantified for accurate evaluation of the forest carbon cycle and NEP.

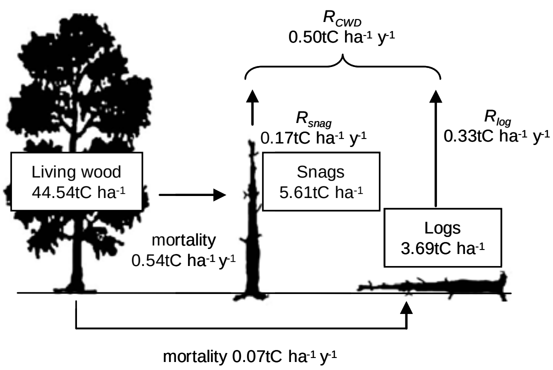

Figure 5. Carbon cycle of coarse woody debris in a temperate broad-leaved secondary forest

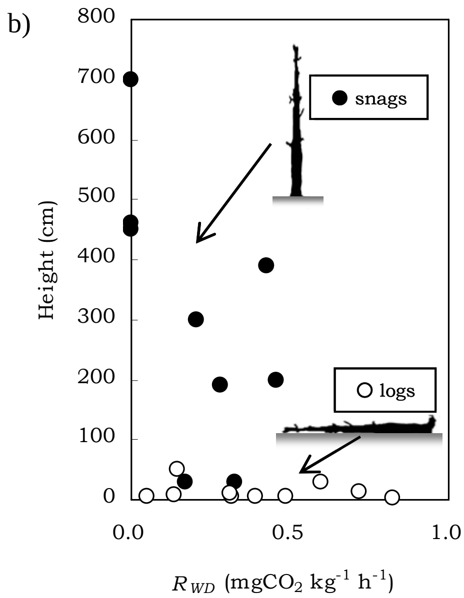

Figure 6. Portable automatic operated measurement system (a) and the vertical distribution of RCWD in a boreal forest

7. Measurement of CWD respiration at PFR

To examine the decomposition respiration of CWD occurred by forest fire in 2004, we measured R_{CWD} of standing and downed CWD and temperature and water content of CWD in 2005.

CWD samples were obtained from snags and logs of black spruce. Temperature of CWD was high (about 25°C), nevertheless R_{CWD} was very low (snags: 0.21±0.18, logs: 0.40±0.26mgCO_2 kg^{-1} h^{-1}). Decomposition rate of snags and logs was estimated to be 0.001 and 0.002 y^{-1}, and mean residence time was about 1000 and 500 years, respectively. The low decomposition rate may be mostly induced by the extremely low water content of CWD. Well-drained soil, the lack of the crown of living trees and little precipitation may cause soil drying in the experimental site in summer season. Similarly, CWD water content became low resulting in low microbial activity. R_{CWD} was significantly different between snags and logs, however, water content and wood density were almost similar. This difference was induced by low R_{CWD} of snag samples located at the high position (more than 4m) and all of these samples did not expose CO_2 (Figure 6). Thus, the height of the CWD position affects microbial invasion resulting in low decomposition rate. The vertical position of CWD may affect decomposition rate of CWD due to both the differences in microbial invasion and water content of CWD. Therefore, the vertical position of CWD may be a significant factor to determine decomposition dynamics of CWD.

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Ecohydrological Modeling and Satellite Remote Sensing for Scaling Terrestrial Carbon and Water Fluxes on Heterogeneous Landscapes

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1. Introduction

The Moderate Image Spectroradiometer (MODIS) sensor onboard NASA Terra and Aqua satellites provides the means for frequent monitoring of the status and seasonal variability in global gross primary productivity (GPP) (Kang *et al*., 2005) and evapotranspiration (ET) (Nishida *et al.*, 2003). Although the MODIS GPP and ET are subjects for validation using field measurements, inconsistency in temporal and spatial scales make it uncertain to utilize the measurements for direct comparisons (Turner *et al*., 2003). Especially, complex terrain often complicates soil-vegetation-atmosphere (SVAT) interactions by generating slope-driven spatial heterogeneities in diverse physical and biogeochemical variables of the SVAT system (Kang *et al*., 2003; 2006). The facts make it difficult to understand response of vegetation structure and function on future climate change in complex terrain, which advocates process-level study to illuminate how environmental variables are affected by terrain topography and interact with vegetation processes, such as leaf phenology, photosynthesis, and evapotranspiration. We are testing the utility of ecosystem models to support extrapolation of field measurements for the MODIS GPP and ET validations. In this letter, we discuss a few preliminary results, especially on water flux components (i.e. evpotranspiration).

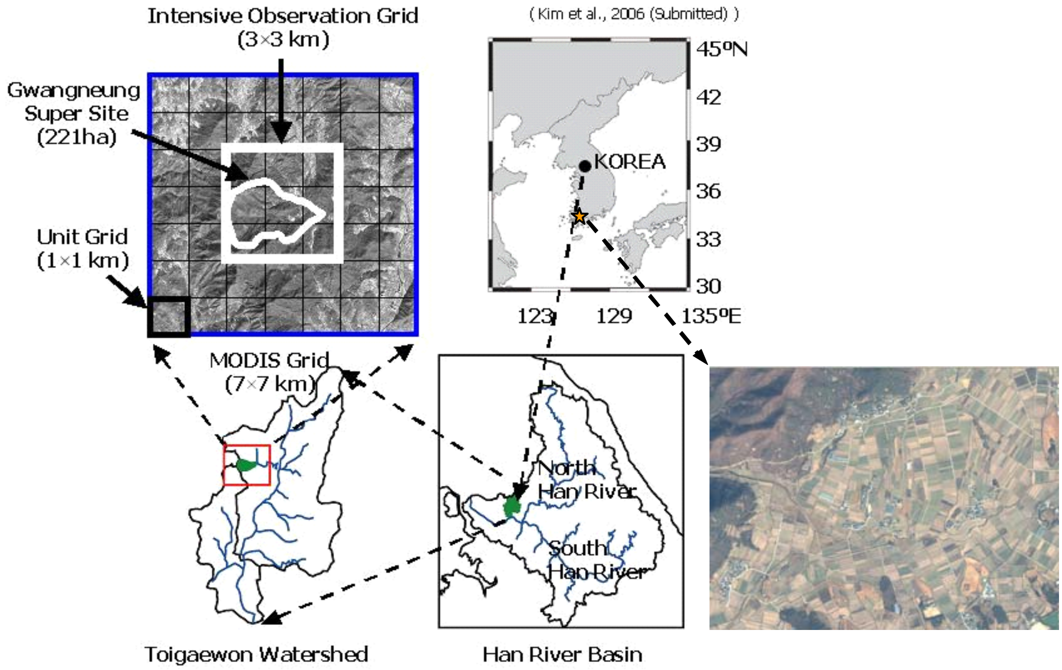

Figure 1. Maps showing the two KoFlux sites utilized in this study: a forested complex terrain site in the GRF site (upper left) and a farmland site in Haenam (lower right)

2. Study Sites

In this study, we select two KoFlux sites, in which eddy-covariance flux tower measurements are conducted: a complex terrain site in the Gwangneung Experiment Forest (GEF) and a farmland site in Haenam (Figure 1). Flux tower data from the Haenam site was utilized for evaluation of satellite-based predictions on evapotranspiration, while ecohydrological data from the GEF site was used for validation of modeled hydrological variables. We are expecting to have flux tower evapotranspiration data soon, and we will then apply the satellite-based evapotranspiration algorithm, originally developed for the Haenam site, to the GEF site and ecohydrological modeling will be utilized as a tool for scaling the flux tower data up to complex terrains.

The GEF site is located in the west-central part of the Korean Peninsula and belongs to a typical cool-temperate broadleaved forest zone. It covers 21.7 km^2 in area, and elevation ranges from 270 to 490 meters. The GEF is composed of numerous vegetation patches of deciduous broadleaf forest (DBF) and evergreen needleleaf forest (ENF) characterized by different stand age and disturbance histories. In general, DBF stands are dominated by *Quercus acutissima*, *Acer palmatum* Thunberg, and *Fraxinus rhynchophylla* Hance. Vegetation age ranges from 80 to 200 years-old, and overstory canopy height is 18-20 m. The DBF stands are natural forest without thinning but with an unknown fire history, whereas the ENF stands are dominated by *Pinus koraiensis* with a mean canopy height of 16 m. The stands were planted 70-80 years ago and have not experienced thinning, with an unknown history of fire. Annual mean temperature and precipitation are 10.2 ^{o}C and 1365 mm y^{-1}, respectively. Two flux towers with eddy-covariance measurement were constructed within the GEF.

The Farmland site in Haenam is located in the southwestern corner of the Korean Peninsula (34.55^{o}N, 126.57^{o}E, 13.7 m above m.s.l.). Land cover around the study site is the mixture of rice paddies and various agricultural crops. Within the first 300 m around the tower, major vegetation was seasonally cultivated crops such as beans, sweet potatoes, Indian millet, and sesame. Beyond this area, rice paddies prevailed in the south and the west. Also, scattered residential areas, roads and isolated forests coexisted. The nearest forest was located about 300 m north of the flux tower. The canopy height of dominant species was approximately 1 m. The soil type at the site varied from silt loam to loam. The site is relatively flat except the southeast section with a slope of about 4 degrees. For the past 30 years, mean annual air temperature was 13.3 ^{o}C with the maximum and minimum of 18.6 ^{o}C and 8.6 ^{o}C, respectively. The annual mean precipitation was 1306 mm (Lee *et al.*, 2003).

3. Methods and Results

3.1. Remote Sensing of Evapotranspiration

Currently, we are undergoing extensive MODIS data processing to extract and estimate meteorological variables and evapotranspiration. Here, some of preliminary results are presented to figure out our overall activity for satellite-based evapotranspiration estimation. MODIS Atmospheric Products (MOD07) from both Terra and Aqua satellites were used to extract air temperature and actual vapor pressure of land surface layer, which were compared to flux tower measurements for 2002 and 2003 (Figure 2a and 2b). To calculate net radiation, we utilized MOD07 surface layer air temperature, MOD11 land surface temperature and emissivity, and MOD43 albedo, while soil heat flux was calculated using MOD11 surface temperature, MOD43 albedo, and MOD13 NDVI (Figure 2d). Although satellite-driven shortwave radiation can be estimated using a solar irradiance model with inputs from diverse MODIS Atmospheric Products (i.e. MOD04 aerosol, MOD07 ozone, MOD07 surface pressure, and MOD05 total precipitable water vapor) (Houborg and Soegaard, 2004), we estimated the solar irradiance using MTCLIM model (version 4.3) for the preliminary study. The above mentioned meteorological and energy flux variables were utilized to calculate evapotranspiration then compared with flux tower evapotranspiration. We tested two evapotranspiration models: a modified Priestly-Taylor model (Fisher *et al*., *in preparation*) (Figure 2e) and a modified Penman-Monteith model (Boegh *et al*., 2002) (Figure 2f).

Preliminary results indicate that though Aqua MODIS provides better estimates than Terra MODIS for air temperature, vapor pressure, and soil heat flux, both sensors resulted in similar errors on net radiation. For evapotranspiration, Terra MODIS showed better estimations than Aqua MODIS for both ET models. The results in Figure 2 relied partly on flux tower meteorological data and now, we are calculating fully satellite-based estimates on meteorological and energy budget variables.

3.2. Ecohydrological Modeling

An ecohydrological model, RHESSys (Regional Hydrological and Ecological Simulation System), was applied in this study to predict temporal and spatial variations of

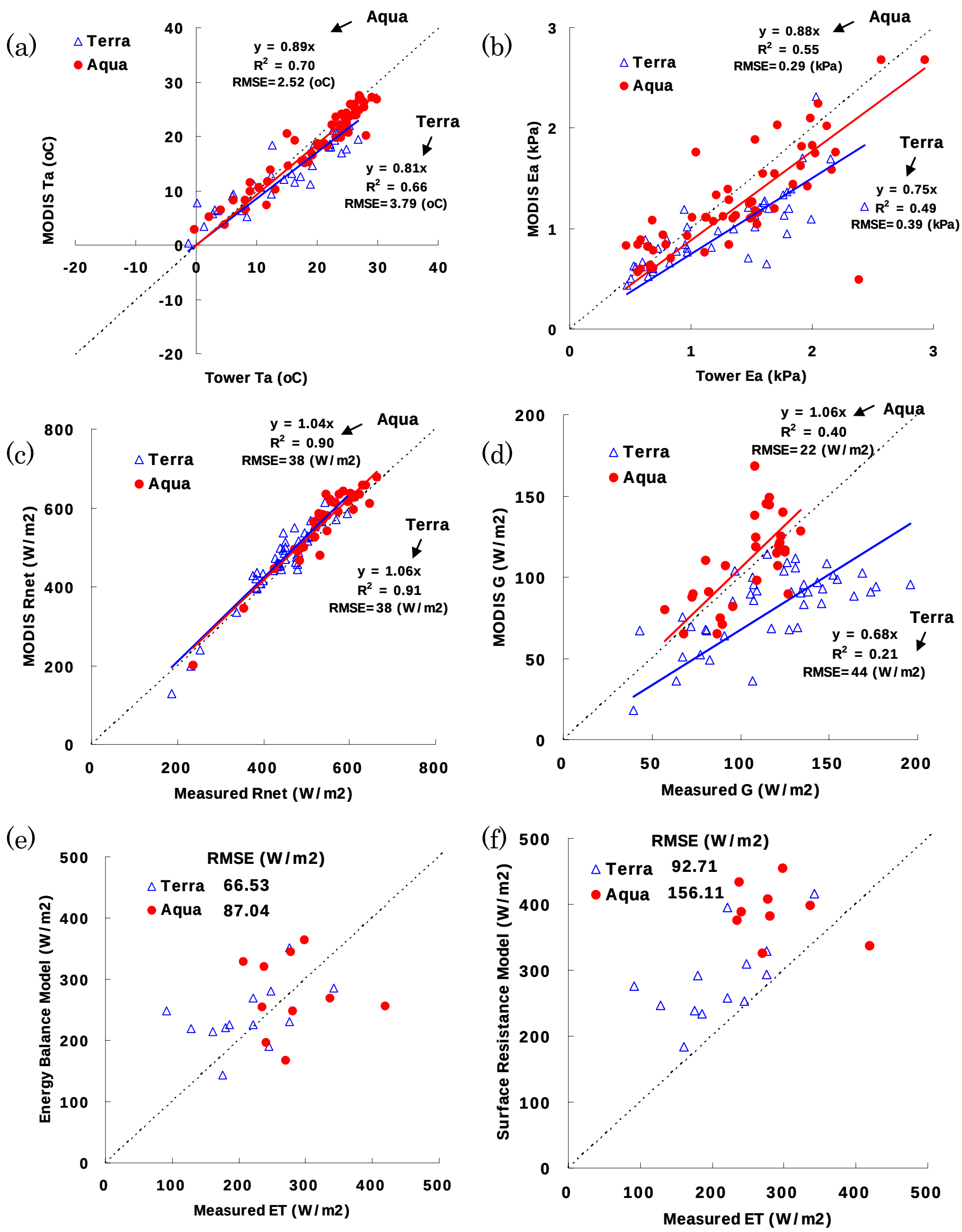

Figure 2. Comparisons between estimated/extracted and measured variables for (a) surface layer air temperature extracted from MOD07, (b) surface layer vapor pressure extracted from MOD07, (c) net radiation estimated by using both MODIS and flux tower data, (d) ground estimated by using MODIS data, (e) ET estimated by using the modified Penman-Monteith model, and (f) ET by using the modified Priestly-Taylor model, respectively.

evapotranspiration. The model originated from models developed in different research areas: meteorology (MTCLIM), ecology (FOREST-BGC), and hydrology (TOPMODEL) (Tague *et al.*, 2001; 2003). Later, a distributed hydrology model (DHSVM) was encoded in the RHESSys. Our primary purpose for ecohydrological modeling is to predict evapotranspiration across complex topographic gradients and hence, to provide representative ET to validate ET derived from coarse resolution satellite images (i.e. MODIS). That is, RHESSys provides a means to extrapolate flux tower ET up to complex terrain scales. Testing for model reliability for predicting spatial pattern of ET is therefore a critical process to assure the role of RHESSys in bridging fine and coarse scale ET estimates. However, because measuring spatial distribution of canopy ET is practically impossible in complex terrains, alternative variables closely relevant with ET are subjects for field monitoring (i.e. soil water content and sapflow). In this study, we used soil water content to validate the models spatial predictability, for which transect measurements were conducted at 10 m interval with a total 139 points (Figure 3). Our scheme for model validation includes watershed-level validation using weir hydrograph data, plot-level validation using continuous TDR measurement, spatio-temporal validation using seasonal line transect SWC measures, and footprint-scale validation using flux tower ET measures.

RHESSys simulation requires intensive effort for parameter calibration and multi-scale model validation processes. The processes are still undergoing and now, we present some

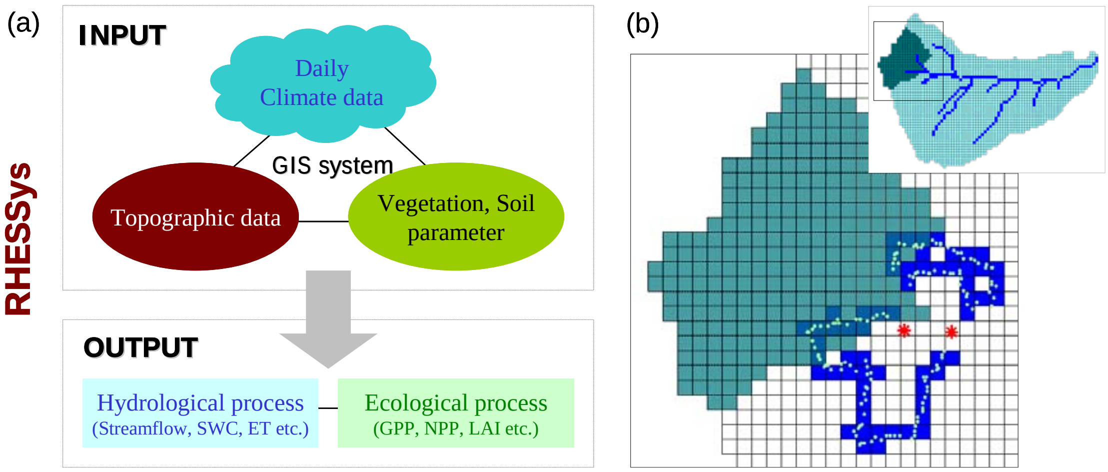

Figure 3. Schematic diagrams on RHESSys and study area: (a) key input and output variables of RHESSys and (b) the GRF watershed (upper right key map) and sampling points for soil water content (dots in right figure). Pixel size is 30 m × 30 m and the asterisk indicates flux tower location.

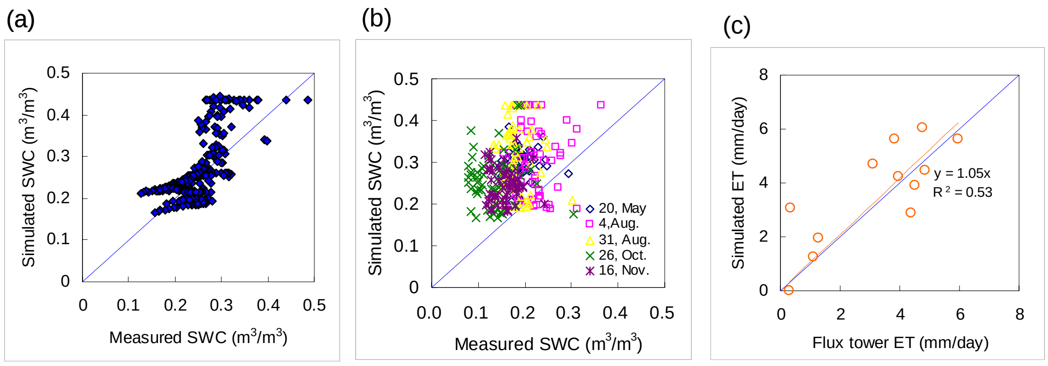

Figure 4. Comparisons between measured and simulated soil water content: (a) daily mean soil water content in 2002 (RMSE = 0.06 m^3/m^3), (b) transect measurements of soil water content in 2005 (RMSE = 0.13 m^3/m^3) and (c) daily ET of flux tower point in 2002 (RMSE = 1.25 mm/day).

preliminary results in Figure 4. Currently, we are implementing the model daily at 30 m resolution in accordance with spatial resolution of Landsat ETM+ image, from which we extract landcover and maximum leaf area index map. The model predicted daily variations of soil water content (Figure 4a) and ET very well (Figure 4c). We tested two alternative hydrologic modules in RHESSys, TOPMODEL and DHSVM, and found the DHSVM results much enhanced model predictions on spatial SWC distribution though still considerable uncertainty exists (Figure 4c). We will utilize the predicted spatial and temporal patterns of ET at 30 m resolution to validate the 1 km MODIS ET estimates.

4. Summary

Linking field ecological and meteorological measurements to satellite remote sensing products is becoming important for validating reliability of high-temporal but low-spatial resolution satellite products (i.e. MODIS) for use of continuous monitoring of terrestrial ecosystem and land-atmosphere fluxes. Instead of simple extrapolation and/or assumption of homogeneity and isotropy, we utilize an eco-hydrological model to extrapolate the field measurements to support MODIS validation at 1 km resolution. Up to now, our preliminary results seems promising for both satellite-driven estimate of ET and extrapolation of field measurements by using an eco-hydrological model, RHESSys. Further study will continue to complete the test of satellite ET estimates using model-driven field data extrapolation.

Acknowledgements

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AsiaFlux Training Course 2006
-Tasks of AsiaFlux Short Training Courses Sub-workgroup-

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Six sub-workgroups (SWGs) were initiated in the AsiaFlux organization in 2005. This is in order to promote our activities, such as improving flux observation techniques and facilitating data accumulation (Ohtani, 2005: AsiaFlux Newsletter No.15). This article describes the main activities of AsiaFlux Short Training Courses SWG and introduces the plan for the first AsiaFlux training course, to be held in August 2006.

Eddy Covariance Method is most commonly used observation technique in FLUXNET communities, based on micrometeorology theory, especially on the formulations of turbulent transfer applied in surface boundary layer. Therefore, micrometeorology is essential knowledge in dealing with flux measurement and its data. In Asian countries; however, researchers who are involved in practical observation do not always have enough theoretical knowledge and skills. It is consequently difficult to carry out accurate observation and deeper study based on their observed data. We have therefore planned a training course to provide essential knowledge on site selection; proper installation and equipment maintenance; and data processing. This course aims to enable tower flux observers in Asia to carry out observations on their own.

Training Course Outline

The first AsiaFlux Training Course 2006 will be held as described below:

Title: AsiaFlux Training Course 2006 on Micrometeorology - Theory and Practice of CO_2 Flux Measurement
Date: Monday, 21 - Wednesday, 30 August 2006
Venue: Tsukuba and Fujiyoshida, Japan

Organizing committee

Leader: SAIGUSA Nobuko
Sub-leader: TAKAGI Kentaro
Members: HIRATA Ryuichi; INUKAI Koh; LIANG Naishen; MURAYAMA Shohei; WANG Huimin; WATANABE Tsutomu; YUTA Satoko (in alphabetical order)

Contents of the course

Lecture subjects will include the atmospheric boundary layer, canopy micrometeorology and data processing. The course will devote most of the time to practical flux measurement and calculation. We are also planning some field studies at forest observation and paddy-field sites. Lecture topics and lecturers are as follows:

- Basic theory of global warming
  HIGUCHI Kaz
- Basic theory of plant canopy micrometeorology
  HONG JinKyu
- Basic theory of the atmospheric boundary layer
  SHAW Roger
- Sensors and flux measurements
  SHIMIZU Takanori
- Practical learning of flux measurement and calculation
  Training course working group
- System maintaining
  HIRANO Takashi
- Quality control & quality assurance
  MIYATA Akira
- Gap filling
  WEN Xuefa
- Field studies
  Training course working group
- Trends and challenges in flux studies
  KIM Joon

As for the lecture "Trends and Challenges in Flux Studies" on the final day, we have in mind to make it an open-seminar, so that anyone interested can participate. The latest information will be available at http://www.asiaflux.net/aftc2006/.

Participants

Much discussion was made at the organizing committee meeting about whom we should target as participants. The course may target researchers who have certain level of experience in basic micrometeorology and flux observations, and providing classes on advanced observation technique (like FLUXNET training courses in Europe and the United States). In that case; however, how much involvement can we count from Asian researchers? Instead, we targeted people who never had opportunity to learn the fundamental theories so that we can give them a guide for further learning. We can also show them the advantage of cooperating in the AsiaFlux network.

As a result of those discussions, we stated the target of our training course as follows:

1) People who are going to establish a local flux-network in his/her country and willing to link up with AsiaFlux
2) People who are currently members of AsiaFlux and willing to achieve a deeper understanding on flux measurement.

When we posted a call for participants for two months in the end of 2005, we received unexpected number of applications, 68 from 18 countries. Applicants from China were greatest in number, followed by Bangladesh, India, Taiwan and Thailand. We also had several applications from Europe and the United States. The academic background of applicants varied widely from atmospheric science, agriculture, biology to engineering. We realized that there is high demand for our flux observation training course in various research fields.

The organizing committee decided to accept no more than 20 participants into the first course. It seems rather small, but we believe it is more important to spend enough time to watch the progress of each participant rather than to give a little bit of everything to a large audience. It is not possible, in the first place, to learn everything about micrometeorology and flux observation over 10 days. This training course should be a trigger for further sustainable learning. We hope our course participants will actively convey what they learn in the course to their colleagues. We also expect them to maintain a good relationship with other participants as well as AsiaFlux members, and to encourage each other to a higher level of achievement after they return to their own countries.

As a result of limiting the number of participants, we unfortunately had no other choice but to decline many of the applicants, especially who belong to research institutes where they may have chance to learn by themselves, or who are not involved in flux observation in Asia at present. We sincerely wish that these applicants who applied but have been declined will understand our situation and hope they can join other AsiaFlux activities in the future.

We are going to report the achievement of the first training course on the AsiaFlux Website. We are currently planning to hold the second training course in 2007. The objectives and contents of the second course will be presented based on feedback from the participants and lecturers of AsiaFlux Training Course 2006. If you have any suggestions or advice, please don’t hesitate to inform us! [Contact address: asiaflux@nies.go.jp]

International Workshop on Flux Estimation over Diverse Terrestrial Ecosystems in Asia - AsiaFlux Workshop 2006 -

November 29 - December 1, 2006, Chiang Mai, Thailand
www.asiaflux.net/workshop2006/

1. Background and Objectives

This 5th AsiaFlux workshop will be the very first workshop in a tropical region. All of the scholars interested in the mass & energy cycle and flux measurement research are welcome to participate in this meeting. We are going to hold a special session emphasizing on observations in a tropical area. In the general sessions, we are going to discuss not only flux but also biogeochemical dynamics from aspects of observation, modeling and scaling-up methodology.

2. Subject

- Flux Measurement and intercomparison
- Biogeochemical Processes including non CO_2 gases
- Modeling and Remote Sensing

3. Venue

Suan Bua Resort & Spa, Chiang Mai, Thailand Website: www.suanbua.com

4. Keynote Speakers

- Dr. Yadvinder Malhi (Oxford University)
- Dr. Joseph Berry (Carnegie Institution of Washington)
- Dr. Monique Leclerc (University of Georgia) ... and more...

5. Registration

Registration will begin on 1 July 2006. The participants should fill out the online registration form and submit it to the AsiaFlux Workshop 2006 Local Organizing Committee by 30 September 2006.

6. Call for Papers

Contributed papers for oral and/or poster presentations are welcome. A one-page abstract of your paper should be submitted by 30 September 2006. Please refer to the official website for abstract format.

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Editor's Note

It is my great pleasure and honor to serve as an editor for AsiaFlux Newsletter No. 18.
I would like to express my sincere gratitude to authors, committee members and secretariats of AsiaFlux for their support and arrangements.

The editor of AsiaFlux Newsletter No.18:
Sanghyun KIM
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