Chair Bio-environmental Science

2.5.2 Laboratory : Forest Hydrology

Member:	Professor	Tani, Makoto
	Assistant Professor	Kosugi, Yoshiko
	Doctor's program	1
	Master's Program	4
	Undergraduate	2
	Program-Specific Resea	a 2

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Gas exchange between forest and the atmosphere

Our laboratory is conducting long-term observations on gas exchange processes between forest and the atmosphere using the eddy covariance method to evaluate the physical and physiological control by forest ecosystem. Our main study sites are located in a Hinoki Cypress forest in Japan and a tropical rainforest in Malaysia, and new findings on uptake and emmsion characteristics of vapor and CO2 have been obtained from detailed observations on and around a tower in each site. This year, we have obtained new findings on relathionships of daily root respiration pattern to the photosysthesis and dependencies of decomposition respiration of leaf and wooden litters on the environmental parameters. In response to recent concerns on the methabne emission under an aerobic condition, we evaluated uptale/emission by a measurement of soil, foliage and stem respirations in our forest site. Based on our recent research agreement with nancy University in France, we have convened a symposium on the use of new techniques to understand gas exchange and carbon dynamics in the forest ecosystem.

b) Water quality and biogeochemistry

Detailed runoff processes and effects of their heterogeneities on biogeochemistry in forested catchments are studied to evaluate roles of forest in water and nutrient cycles. This year's topic was a difference in groundwater and water chemistry among small catchments, and their differences could be explained by quntitative characteristics on the discharge of groundwater from teh bedrock through their effects on the mean residence time and water budget in each catchemnt. We also discussed on the estimation of runoff mechanisim using water stable isoptope in our conducting seminar on stable isotope studies supported by our graduate school.

c) Runoff control through forest management

Change in annual evapotranspiration from a small catchment by a 60-year growth of broad-leaved forest after a clearfelling of pine forset was analyzed, and its dependence on the annual air tempearture was found. However, an interesting findeing was that an increase in recent years with a very warm condition was larger than that expected from the tempearture rise in older years.

A-2.Publications and presentations

a) Publications

Original Papers(including book-reviews)

- Kosugi, Y., Itoh, M., Matsubara, T., Takanashi, S., Osaka, K., Mizota, Y., Dannoura, M., Shimamura, T., Makita, N.: Partitioning of respiratory CO2 fluxes in a managed C3 turfgrass field, Journal of Agricultural Meteorology 66(3), 151-161, 2010.

- Kosugi, Y., Osaka, K., Itoh, M., Takanashi, S., Photosynthesis and respiration of managed C3 turfgrass fields under various light conditions Matsubara, T., Journal of Agricultural Meteorology 66(3), 163-171, 2010

- Katsuyama, M., Tani, M., Nishimoto, S.: Connection between streamwater mean residence time and bedrock groundwater recharge/discharge dynamics in weathered granite catchments, Hydrological Processes, 24, 2287-2299, 2010.

- Makita, N., Hirano, Y., Mizoguchi, T., Kominami, Y., Dannoura, M., Ishii, H., Finer L., Kanazawa Y.: Very fine roots respond to soil depth:,biomass allocation, morphology, and physiology in a bload-leaved,temperate forest, Ecological Research 26,95-104, 2011.

- Osaka, K., Ohte, N., Koba, K., Yoshimizu, C., Katsuyama, M., Tani, M., Tayasu, I., Nagata, T.: Hydrological influences on spatiotemporal variations of d15N and d18O of nitrate in a forested headwater catchment in central Japan: Denitrification plays a critical role in groundwater, Journal of Geophysical Research, 115, G02021, doi:10.1029/2009JG000977, 2010.

- Fukuzawa, K., M. Dannoura, M, Kanemitsu, S., Kosugi, Y.: Seasonal patterns of root production of Japanese oak seedlings and dwarf bamboo grown in rhizoboxes. Plant Biosystems, 144, 434-439, 2010

⁻ Matsubara, T., Kosugi, Y., Takanashi, S., Mizota, Y., Itoh, M., Osaka, K., Fujimoto, M., Ohkubo, S.: Seasonal fluctuations in growth/decline and single-leaf gas exchange of C3 turfgrass fields under various light conditions, Journal of Agricultural Meteorology, 67(1), 1-12, 2011.

- Takanashi, S., Kosugi, Y., Ohkubo, S., Matsuo, N., Tani, M., Abdul Rahim, N: Water and heat fluxes above a lowland dipterocarp forest in Peninsular Malaysia, Hydrological Processes, 24, 472-480, 2010.

- Yamakawa Y., Kosugi K., Masaoka N., Sumida J., Tani M., Mizuyama T.: Estimation of soil rhicknness distribution on a granite hillslope using electrical resistivity method. International Journal of Erosion Control Engineering 3, 20-26, 2010.

- Fujimoto M., Ohte N., Tani M.: Effects of hillslope topography on runoff response in a small catchment in the Fudoji Experimental Watershed, central Japan. Hydrological Processes 24, 1874-1886, 2011.

b) Conference and seminar papers presented

-The 121st Annual Meeting of Japanese Forestry Society: 5 topics. Japan Geoscience Union Meeting: 2 topics. The Annual Meeting of Japan Society of Hydrology and Water Resources: 1 topic. The 58th Annual Meeting of Japanese Ecological Society: 6 topics. Western Pacific Geophysics Meeting 1 topic, American Geophysical Union Fall Meeting: 1 topics. AsiaFlux Workshop: 4 topics. Annual Meeting of Agricultural Meteorology: 4 topics, Annualmeeting of Kinki Branch of Agricultural Meteorology: 2 topics, The 61th Annual Meeting of Kansai Branch of Japanese Forestry Society: 3 topics, The 33th Root Reseach 1 topic, Belowground Carbon Turnover Workshop 1 topic, Symposium on the use of new techniques to understand gas exchange and carbon dynamics in the forest ecosystem 8 topicss.S38

A-3.Off-campus activities 1

Membership in academic societies

- Tani, Makoto : Vice president, Japan Scoiety of Hydrology & Water Resources.

- Kosugi, Yoshiko : Japan Flux Network (Member of steering committee)

- Katsuyama, Masanori : Japan Scoiety of Hydrology & Water Resources (Member of Editorial Review Board of Hydrological Research Letters)

Membership in Science Council of Japan, etc.

- Tani, Makoto : National Committee Member of IAHS

A-3.Off-campus activities 2

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Grants-in-Aid for Scientific Research (A) Oversea research : Kosugi, Yoshiko : Gas exchanges of Southeast Asian tropical rainforest

- Grants-in-Aid for Scientific Research (B) : Kosugi, Yoshiko : The use of TDLS for the estimation of trace-gas dynamics in terrestrial ecosystem

- JSPS International Collaborations : Kosugi, Yoshiko : The use of stable carbon isotope to understand the carbon cycle in the forest

- Grants-in-Aid for Scientific Research (A) Oversea research : Hirano, Takashi : Elucidating forestatmosphere interactions in South-East Asia based on the tower-observation networking

2. Other Research Grants

- Mitsui & Co., Ltd. Environment Fund: Tani, Makoto: Strategic study on an utilaization of forest functions in hydrological processes to the watershed management

- Global COE Program: Sugihara, Kaoru: Search of Sustainable Humanosphere in Asia and Africa

- Industry-academia-government collaboration: Kousgi, Yoshiko : Modelling photosysnthesis and growth of warm season (C4) turf grasses

A-4.International cooperations and overseas activities 1

Membership in academic societies

- Tani, Makoto: IAHS/ICCLAS National representative

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

 - Undergraduate level: Basic Science for Forest and Biomaterials 3 (Tani), Forest and Biomaterials Sceince 3 (Tani), Forest Hydrology (Tani), Interaction of Forest and Environment (Kosugi, Tani), Laboratory Course in Forest and Biomaterials Science 3 (Tani, Kosugi), Laboratory Course in Physics of Forest and Biomaterials (Kosugi), Laboratory Course in Forest Hydrology and Erosion Control (Tani, Kosugi), Practice in University Forest 2 (Tani, Kosugi). - Graduate level: Forest Environmental Physics (Kosugi), Seminar of Forest Hydrology (Tani, Kosugi), Special Laboratory Work in Forest Hydrology (Tani, Kosugi)

B-2.Off-campus teaching etc.

Part-time lecturer

- Tani: Faculty of Life and Environmental Sciences of Kyoto Prefectural University, Forest Hydrology