

Chair Forest and Forestry Production

2.2.3 Laboratory : Forest Utilization

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| Member : | Assistant Professor | Dannoura, Masako, Dr. Agric. Sci. |
| | Doctor's program | 4 |
| | Master's Program | 7 |
| | Undergraduate | 3 |
| | Post-Doctoral fellow | 1 |

A. Research Activities (2009.4-2010.3)

A-1. Main Subjects

a) Stand development and carbon dynamics of boreal forests

Stand development and carbon accumulation and dynamics after large-scale disturbances are studied in boreal forest ecosystems, particularly of high-latitude coniferous forests in the northern hemisphere. Chronosequence stands have been selected, their stand structures measured, and carbon dynamics patterns estimated by the ecological summation method in jack pine forests and black spruce forests of northern Canada. Sum of fine-root ingrowth and mortality was estimated. It was suggested that approximately 80% of NPP of these forest ecosystems goes to the fine-root increment. Generality of this estimate needs to be examined by further analyses. In addition, a new research on reconstructing forest structure in a forested area of about several square kilometers has been in progress by applying the method of silvichronology.

b) Radial growth of plantation trees and relating factors in tropics

Radial growth of plantation trees and relating factors were compared in Chachoengsao, Thailand and Selangor, Peninsula Malaysia. In Chachoengsao, leaf water potential decreased and radial growth also decreased in the dry season. Thus, water shortage seemed to influence radial growth, but the effect was different among species. In Selangor, leaf water potential was not different through a year, but still trees showed rhythmic radial growth. Thus, there was a certain factor(s) other than water affecting tree growth.

c) Tree architecture of broadleaved trees and relating factors

Branch size and angle of *Swida controversa* and *Pterocarya rhoifolia* were measured and factors affecting their tree architecture were examined. *S. controversa* horizontally extended branches to effectively capture sun light, and consequently received much load on the branch base. To support the load, the wood has high density and mechanical strength. *P. rhoifolia* steeply spread branches, and less effective in capturing sun light than *S. controversa*. However, since branch base received fewer loads than that of *S. controversa*, the wood has low density and mechanical strength. The differences in tree architecture between two species were attributable to their regeneration system; *S. controversa* solely appeared in a gap, whereas *P. rhoifolia* formed an even-aged stand in a disturbed site.

d) Analysis of forest carbon dynamics with stable carbon isotope labelling

In a CATS (Carbon Allocation of Tree and Soil) project in France for carbon stable isotope labelling experiment, measurements of 1) continuous soil respiration for estimation of the velocity of photosynthate allocation to roots and 2) ^{13}C carbon concentration in roots were conducted. The velocity of photosynthate allocation to belowground organs differed among three main tree species: beech, oak, and pine. It took 10-32h for the photosynthate to reach root systems in the angiosperm trees (beech and oak), but it was 40-120h, nearly four-folds in required time, in the gymnosperm (pine). The velocity of carbon movement in pine root was 0.09m/h in the pine.

A-2.Publications and presentations

a) Publications

Books

- Osawa, A., O.A. Zyryanova, Y. Matsuura, T. Kajimoto, and R.W. Wein (eds.): Permafrost Ecosystems: Siberian Larch Forests (Ecological Studies). Springer-Verlag, Berlin (2010)

- Osawa, A., O.A. Zyryanova: Introduction. In: A. Osawa et al. (eds.) Permafrost Ecosystems: Siberian Larch Forests (Ecological Studies). Springer-Verlag, Berlin (2010)

- Osawa, A., T. Kajimoto: Development of stand structure in larch forests. In: A. Osawa et al. (eds.) Permafrost Ecosystems: Siberian Larch Forests (Ecological Studies). Springer-Verlag, Berlin (2010)

- Osawa, A., Y. Matsuura, T. Kajimoto: Characteristics of larch forests in Siberia and potential responses to warming climate. In: A. Osawa et al. (eds.) Permafrost Ecosystems: Siberian Larch Forests (Ecological Studies). Springer-Verlag, Berlin (2010)

- Kajimoto, T., A. Osawa, V.A. Usoltsev, A.P. Abaimov: Biomass and productivity of Siberian larch forest ecosystems. In: A. Osawa et al. (eds.) Permafrost Ecosystems: Siberian Larch Forests (Ecological Studies). Springer-Verlag, Berlin (2010)

- Mori, S., S.G. Prokushkin, O.V. Masyagina, T. Ueda, A. Osawa, T. Kajimoto: Respiration of larch trees. In: A. Osawa et al. (eds.) *Permafrost Ecosystems: Siberian Larch Forests (Ecological Studies)*. Springer-Verlag, Berlin (2010)

- Okada, N.: Stable Isotope Measurement. In S. Kaneko et al. (eds.): *Methods of Forest Environment Survey*, Hakuyusha, Tokyo (2010)

Original Papers(including book-reviews)

- Mori S., K. Yamaji, A. Ishida, S.G. Prokushkin, O.V. Masyagina, A. Hagihara, R.A.T.M. Hoque, R. Suwa, A. Osawa, T. Nishizono, T. Ueda, M. Kinjo, T. Miyagi, T. Kajimoto, T. Koike, Y. Matsuura, T. Toma, O.A. Zyryanova, A.P. Abaimov, Y. Awaya, M.G. Araki, T. Kawasaki, Y. Chiba, M. Umari. (2010) Mixed-power scaling of whole-plant respiration from seedlings to giant trees. *Proceedings of the National Academy of Sciences, USA*. 107:1447-1451.

- Tran V. D., A. Osawa, and T.T. Nguyen. Recovery process of a mountain forest after shifting cultivation in northwestern Vietnam. *Forest Ecology and Management* (2010).

- Tran Van Do, Akira Osawa, Nguyen Toan Thang, Nguyen Ba Van, Bui Thanh Hang, Cam Quoc Khach, Le Thi Thao, and Diep Xuan Tuan (2011) Population changes of early successional forest species after shifting cultivation in Northwestern Vietnam, *New Forests* vol. 41, no. 2: 247-262.

- Ohashi, S., N. Okada (2010) Amir Affan Abdul Azim, Ahmad Zuhaidi Yahya and Tadashi Nobuchi, Estimation of tree age in the humid tropics by vessel measurement: A preliminary study. TROPICS, in press.

- Okada N., Y. Hirakawa and Y. Katayama (2010) Application of activable tracers to investigate radial movement of minerals in the stem of Japanese cedar (*Cryptomeria japonica*). Journal of Wood Science, in press.

- Fukuzawa, K. Dannoura, M., Kanemitsu, S., Kosugi, Y. (2010). Seasonal patterns of root production of Japanese oak seedlings and dwarf bamboo grown in the rhizoboxes. Plant Biosystems 144(2):434-439

- Dannoura M., Maillard P., Fresneau C., Plain C., Berveiller D., Gerant D., Chipeaux C., Bosc A., Ngao J., Damesin C., Loustau D., and Epron D. (2011) In situ assessment of the velocity of carbon transfer by tracing ¹³C in trunk CO₂ efflux after pulse labelling: variations among tree species and seasons. New Phytologist 190:181-192.

- Makita N., Hirano Y., Mizoguchi T., Kominami Y., Dannoura M., Ishii H., Finer L., and Kanazawa Y. (2011) Very fine roots respond to soil depth: biomass allocation, morphology, and physiology in a broad-leaved temperate forest. Ecological Research 26(1):95-104.

- Yoichi Kanazawa, Masako Dannoura, and Miho Fukui. (2010) Land-use change caused by changes in rural resource use in a rural village near the city of shiso, in Hyogo Prefecture. Ap. For.Sci. 19(2): 1-6

b) Conference and seminar papers presented

- The 20th Ann. Meet. Jpn. Soc. Trop. Ecol. (2 presentation)

- The 25th Ann. Meet. Jpn. Soc. Vegetation History (1 presentation)

- The 57th Ann. Meet. Ecol. Soc. Jpn. (5 presentations)

- The 121th Ann. Meet. Jpn. Forest Soc. (3 presentations)

- The 122nd Ann. Meet. Jpn. Forest Soc. (4 presentations)

- The 61th Joint Ann. Meet. Jpn. For. Soc. Kansai Br. And Jpn. For. Tech. Soc. Kansai & Shikoku Br.
(1 presentation)

- International Workshop on “Forest Dynamics and Carbon Monitoring in Forest Ecosystems in East Asia - Findings from Forest Dynamics Network”, 5-8 September 2010, Tokyo, Japan 5件

- 1st International Symposium on Turkish-Japanese Environment and Forestry. November 4-6, Trabzon, Turkey 1件

- Symposium on the usage of new techniques to understand the carbon dynamics in the forest ecosystem 1件

- International Symposium on Isotope Ecology 2010 1件

- Analysing post labelling experiments COST Action: ES0806 3 Mar 2010., Nancy University, France, Oral 1件

- COST 1-4 September 2010, Estonia 1件

- AGU 1 December 2010, San Francisco, USA 1件

- Symposium on the usage of new techniques to understand gas exchange and carbon dynamics in the forest ecosystem 1 November 2010, Kyoto, Japan 1件

- Fifth International Symposium on Physiological Processes in Roots of Woody Plants, 8-12 August 2010, Victoria, Canada, 3件

A-3.Off-campus activities 1

Membership in academic societies

- Osawa, Akira, Ph.D. : Jpn. Forest Soc. (member), Jpn. Ecol. Soc. (member)

- kada, Naoki, Doc. Agr. Sci. : Jpn. Forest Soc. (member), Jpn. Ecol. Soc. (member), Jpn. Soc. Trop. Ecol. (member), Jpn. Wood Res. Socl. (member)

- annoura, Masako, Doc. Agr. Sci. : Society for Root Studies (Advisory Board), Jpn. Forest Soc. (member)

A-3.Off-campus activities 2

Research grants

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

- Monbu-Kagakusho Research Grant: Scientific Research (B) (Overseas) : Osawa Akira :
Silvichronology: Reconstruction of past increment in forest biomass, analysis of its variation, and prediction for future growth

- Monbu-Kagakusho Research Grant: Scientific Research (B) (Overseas) : Matsuura Yojiro : Evaluating the effects of permafrost depth variations on forest carbon accumulation and forest floor structure and function

- Monbu-Kagakusho Research Grant: Scientific Research (B) (Overseas) : Okada Naoki : Forest fire and vegetation changes in the tropical seasonal forests in Thailand

- Monbu-Kagakusho Research Grant: Scientific Research (B) (Overseas) : Sakai Masaharu : Regeneration of forests in degraded grass land and isotopic chronology of soil carbon in tropics

- Monbu-Kagakusho Research Grant: Scientific Research (A) (Overseas) : Kitayama Kanehiro : Atmospheric oscillation and formation of treeline in mountains in Walker Circulation System

2. Other Research Grants

- JSPS Japan-Russia Bilateral Exchange (Joint Research) : Kajimoto Takuya : Plant species diversity and productivity in permafrost larch ecosystems of Central Siberia

A-4. International cooperations and overseas activities 1

International meetings(country,roles)

- annoura Masako : Asia Flux (member)

International joint research, overseas research surveys

- Silvichronology: Reconstruction of past increment in forest biomass, analysis of its variation, and prediction for future growth, Osawa Akira, Canadian Forest Service, Pacific Forestry Centre, and Aurora Research Institute, Canada

- CATS (Integrated Monitoring Carbon Allocation in Tree and Soil project), Daniel EPRON, FRANCE

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level : Measuring tropical forests (Okada), Social and environmental changes under sustainable development in Monsoon Asia (Okada), Basic Science for Forest and Biomaterials IV (Osawa), Forest Utilization (Osawa), Tree Physiology (Okada), Mushroom Science (Okada), Reading of Foreign Literature II (Osawa), Seminar in Forest Utilization (Osawa, Okada, Dannoura), Introduction to Research (Osawa, Okada, Dannoura), Comprehensive Practice in Forest (Okada, Dannoura), Practice for Forest Utilization (Osawa, Okada, Dannoura), Laboratory Course in Forestry and Biomaterial Science IV (Okada),
- Graduate level : Scientific writing and presentation in English (Okada), Seminar in Forest Utilization (Osawa, Okada, Dannoura), Laboratory course in Forest Utilization (Osawa, Okada, Dannoura)

B-3.Overseas teaching 1

International students

- International students : Doctral 1 (Vietnam) Research Students 1 (France)

B-3.Overseas teaching 2

Lectures and seminars

- Osawa Akira

Global warming, carbon, and boreal forests of northern Canada and Siberia(Lecturer) : Aurora College,
Fort Smith, Canada(Canada)

From stem analysis to stand and regional vegetation analysis: use of stem-analysis data in estimating
long-term development of forest structure(Lecturer) : Institute of Ecology, Tallinn University(Estonia)

Silvi-chronology: reconstructing and forecasting long-term development of forest structure and growth
without the use of permanent plot data(Lecturer) : Department of Silviculture, University of
Istanbul(Turkey)

C.Other Remarks

- Osawa Akira :Environment Agency, Integrated Global Environmental Studies Project, Advisory Board