Annual Report 2006

Geographic Environmental Sciences

Department of Geography
Graduate School and Faculty of Urban Environmental Sciences
Tokyo Metropolitan University
## Contents

1 Laboratory of Quaternary Geology and Geomorphology 1
   1) Staff
   2) Overview of Research Activities
   3) List of Research Activities in 2006

2 Laboratory of Climatology 5
   1) Staff
   2) Overview of Research Activities
   3) List of Research Activities in 2006

3 Laboratory of Environmental Geography 10
   1) Staff
   2) Overview of Research Activities
   3) List of Research Activities in 2006

4 Laboratory of Global Environmental Changes 16
   1) Staff
   2) Overview of Research Activities
   3) List of Research Activities in 2006

5 Laboratory of Geographical Information Sciences 19
   1) Staff
   2) Overview of Research Activities
   3) List of Research Activities in 2006

6 Laboratory of Urban and Human Geography 22
   1) Staff
   2) Overview of Research Activities
   3) List of Research Activities in 2006
1 Laboratory of Quaternary Geology and Geomorphology

1) Staff
Haruo YAMAZAKI Professor / Dr.Sc.
Geomorphology, Quaternary Science, Seismotectonics

Takehiko SUZUKI Associate Professor / PhD (D.Sc.)
Geomorphology, Quaternary science, Volcanology

2) Overview of Research Activities
Our laboratory aims to study the various earth scientific phenomena and processes on the solid earth surface. Especially, main object of our research is to prospect the futuristic view of our environment changes through the understanding of the history and process of landform development during the Quaternary period. The followings are some examples of our studies.

Tephra study: Tephra means a generic term on the volcanic ejecta excluding lava-flow and related explosive deposits. We are trying to identify the source volcano, age of the eruption and the distribution of widespread tephras that have covered the Japanese Islands through the Pliocene, Pleistocene and Holocene.

Reconstruction of paleo-environment and land forming process: Using tephra deposits as key time markers, we are reconstructing the paleo-environment and land forming process since the late Pliocene in Japan.

Paleo-sea-level change: We are trying to reconstruct the universal Quaternary sea-level changes through the modeling of crustal deformation based on the geological and geomorphological data along the coastal region.

Plate tectonics: The Quaternary tectonics including the historical process of seismic and volcanic activity are our special interest along the plate collision zone in central Japan.

Natural hazards: We study the historical process of topographic changes caused by mass movement, volcanic eruption and fault activity to prevent and mitigate the future natural hazards.

3) List of Research Activities in 2006

Peer-reviewed Articles
Suzuki, T. and Nakayama, T. 2007 A 2.0 Ma widespread tephra associated with a large-scale

**Other Articles**


**Reports**


**Book reviews**


**Miscellaneous articles**


Yamazaki, H. 2006. The role of the Quaternary studies to solve the environmental issues: as an instance for the geological disposal of the high level radioactive waste. 2006 JA QUA meeting and Symposia, Hachioji Tokyo.


Suzuki, T. 2006. Landform in Tokyo and its development: the history during the last 2 million years. Tokyo Metropolitan University Open University, Tokyo.


Tamura, I, Yamazaki, H. and Mizuno, K. 2006. The age of Inubou Group based on tephra correlations. The 113th Annual meeting of the Geological Society of Japan(Kochi)
2 Laboratory of Climatology

1) Staff
Takehiko MIKAMI  Professor / PhD(D.Sc.)
Urban climatology, Climatic variation

Jun MATSUMOTO  Professor / D. Sc
Monsoon climatology

Tomoko NAKANO  Assistant Professor / PhD (D.Sc.)
Land-atmosphere interaction, Carbon cycle, Biogeoscience

2) Overview of Research Activities
Our studies cover various scales of climate from urban to global phenomena, aiming at understanding their climatic processes and mechanisms. We use a wide variety of techniques such as field observation, data collection in historical climate, and statistical analysis of global scale dataset. Our research topics are as follows:

* Urban climate (observation and analysis for heat island and cool island)
* Climate change (historical and observational period)
* Compiling database for paleoclimatic record measured by meteorological instruments
* Seasonal march of Asian Monsoon and its variation
* Climatological studies by using remote-sensing data
* Carbon dioxide exchanges between grassland and the atmosphere in a semiarid region
* Heat and water budget in a semiarid ecosystem

3) List of Research Activities in 2006

Peer-reviewed Articles


**Other articles**


Inoue, T. and Matsumoto J. 2006. Recent interdecadal changes observed in the summer seasonal marches over East Asia. *Monthly Kaiyo* Special Issue, 44, 169-175. (in Japanese)


Nakano, T., Nemoto, M., and Shinoda, M. 2007. CO2 exchanges between grassland ecosystem and
the atmosphere in Mongolia. *Bulletin of the Terrestrial Environment Research Center, the University of Tsukuba* 7 supplement 2: 51-53. (in Japanese)

**Books**


**Reports**


**Miscellaneous reports**


**Presentations**


Mikami,T. 2006. Global cooling in the early 1800s - Links with solar and volcanic forcing -. International Workshop on Historical Climate Simulations over East Asia, Beijing, China.


Hirano,J. and Mikami,T. 2006. Temperature variations in winter during 19th century reconstructed
from weather patterns. Annual meeting 2006, Meteorological Society of Japan, Tsukuba. (in Japanese)


3 Laboratory of Environmental Geography

1) Staff
Nobuyuki Hori  Professor / D.Sci.
Environmental Geomorphology, Landscape Ecology, Study of Environmental Changes

Shuichi Oka  Associate Professor / D.Sci.
Vegetation Geography, Landscape Ecology

Shuichi Oyama  Assistant Professor / PhD (D. Human and Environment)
Area Study (Africa, South America), Environmental Geography, Ecological Anthropology

2) Overview of Research Activities
Our laboratory focuses on the relations between human and natural environment. Especially we attach great importance on the structure and its changes of the relationships in the local and global scales. Therefore we are trying to apply inter-disciplinary approach flexibly, with not only physical and human geography but also other environmental sciences, such as botanical science, forest ecology, zoology, soil science, landscape design, political ecology, folklore, anthropology and so on. Research methods are primarily based on fieldwork, including weather observation, land survey, interview survey and participatory research as well as analysis of aerial photos and satellite images. Study fields are all over the world, especially Japan, Asia, Africa and America. We are engaged in long-term fieldwork on (1) environmental changes and human responses in Africa, (2) vegetation and climatic landscape in north and south America and Siberia, (3) karst topography including coral reef in tropical area and Europe, and (4) cultural ecology of slash-and-burn cultivators in Africa. Recent themes are as follows:

1) Interrelation between environmental change and human response in savanna area of Africa
2) Process of land degradation in environment (ex. desertification, and savannization )
3) Coral reef formation and interrelation between coral and reef topography
4) Geo-ecological research on landscape and the change in alpine and sub-alpine
5) Hydro-climatic environment based on the water balance in the Bonin Islands, Japan
6) Climatic landscape in view of vegetation and land use
7) Cultural geography of slash-and-burn cultivators and development of cultivation system in miombo woodland zone of Africa
8) Applied ecological study to combat desertification in Sahel zone, Africa.
9) Domestication of camelid animals and Solanum crops in Andes, South America
10) Use of natural resource in the Polish Carpathians
11) Genetic distribution of beech tree, Japan
12) Change of environment and community by building dam in Tenryu River area, Japan
13) Vegetation structure and its environmental factors around the timberline of Mt. Fuji, Japan
14) Change of social organization and form of occupation in a fishermen village of Izu Peninsula, Japan
15) Spatial structure and ecological environment in Ryukyu Islands, Japan
16) Physical environment and land use in wetland area, Japan
17) Interrelation between organization of disaster prevention and community characteristic, Japan

3) List of Research Activities in 2006

Peer-reviewed Articles

Other Articles
Oka, S. 2006.Understanding the forest of vegetation-the distribution, morphology and function. In
Kikuchi, T. and Inui, T. (eds.), Realizing Forest and Learning from Forest-to enjoy life in forest, Series of Meguro City College, 6, 54-64, Ninomiya-shoten (in Japanese)


Oyama, S. 2006. Desertification, forest degradation and organic circulation between rural and urban areas. In Kikuchi, T. and Inui, T. eds. Understanding and learning forest ecology- For getting close to the forest In Kikuchi, T. and Inui, T. (eds.), Realizing Forest and Learning from Forest-to enjoy life in forest, Series of Meguro City College, 6, 101-111. Ninomiya-shoten. (in Japanese)


Oyama, S. 2007. Desertification and daily life of cultivators in Sahel area of West Africa. In Ikeya,


Books


Reports


Miscellaneous reports


Oyama, S. 2006. The environmental recognition and coping techniques of Hausa cultivators to desertification in Sahel area.


Presentations

Hori, N. 2006. The eternity of the “Mona Lisa” Opening Lecture for Meguro City College, Tokyo.


Oka, S. 2006. How to understand the nature?-fundamental of understanding the environments: fundamental of climatology and meteorology concerning vegetation. The training course of support ranger, Open University of Tokyo Metropolitan University. Tokyo.


Oka, S. 2007. The Maya civilization and the Andean civilization. Meguro City College in 2007,
World Mountains—their nature and culture, Tokyo.


Kikuchi, T., Oka, S., Yamamoto, M., Obara, N. and Arima, T. 2007. Considering the preservation of Satoyama in the suburbs and the sustainment of rural environments—walking and seeing the rurality of Satoyama and Yato (small valley and its surrounding forest) in Jike, Aoba-ku, Yokohama City. Guidance of the excursion in The General Meeting of the Association of Japanese Geographers in 2007 Spring,


4  Laboratory of Global Environmental Changes

1) Staff
Hitoshi FUKUSAWA  Professor / PhD (D.Sc.)
Sedimentology

2) Overview of Research Activities
This laboratory is going to study global environmental changes, along with causes to trigger such changes. The study periods are Tertiary and Quaternary including historical era. Based on the analyses and dating of glacial landforms, deep-sea and lake sediments, paleosol, microfossil of plants on the land surface, this laboratory is going to reconstruct the environment from the viewpoint of physical geography, sedimentology, and ecology. The main study themes in this laboratory are listed as follows.

1) Study on the relationship between surface environmental changes and human activities in late Quaternary
   • The relationship between environmental changes and human activities from the last interglacial to historic era is clarified by field surveys. Concretely, data concerning glacial landforms, strata, lake deposits, loess, paleosol, pollen and coral rings are collected in the mountains, lowlands, lakes in the east/central Asia and surrounding ocean, then, they are analyzed.
   • The relationship between environmental changes and human activities in Holocene is clarified by detecting sea level changes variation, climate change and earthquakes. Concretely, the analyses of grain size distribution, mineral composition, and contents of organic matter in the lake deposits in the east Asia are carried out.

2) Study on the variability of ice sheets and ocean in the earth system
   • Clarification of the relationship between glacial-interglacial cycle and ocean circulation, and process and causes of the Cenozoic and Quaternary glaciations, by analyzing marine sediments and landforms on the continental ice sheets.

3) Dating of Quaternary samples
   • By the optically stimulated luminescence dating method on terrestrial deposits and the thermo-luminescence dating method on tephras, numerical ages as datum planes are added to environmental changes obtained by field surveys and by analyses.

In the fiscal year of 2006, Laboratory of Global Environmental Changes conducted researches to
accurately reconstruct paleo-environmental changes globally and locally. Based on these analyses, climate changes and man-made environmental changes recorded in the reconstructed data are clarified to propose a paradigm of human activities to sustainable society in the future. The field surveys were conducted not only in Japan but also in Easter island, Guatemala, China and Korea. The results obtained were presented at symposiums and workshops in Japan and foreign countries. Especially, the following six study themes were promoted in 2006.

1) Necessity of the study on the past global environmental changes and its method: Roma Club’s model to predict future and the “problem of the year 2020”
2) Study on the variability of climate and sea level in the past 10,000 years: In relation to the activity of the sun
3) Study on the glacial-interglacial cycle and the prediction of the future: In relation to the orbital elements
4) Study on preventing global temperature rise: Nature-Tech
5) Study on the evaluation of environment: Regeneration, restoration and preservation of nature
6) Study on the utilization history of environment in the city: Edo - A city utilizing the sea level variation

3) List of Research Activities in 2006

*Peer-reviewed Articles*


Presentations at International Conferences

5 Laboratory of Geographical Information Sciences

1) Staff
Hiroshi MATSUYAMA    Associate Professor / PhD (D.Sc.)
Hydrometeorology, Geographical Information Sciences

Takeki IZUMI    Assistant Professor / PhD (D.Eng.)
Urban Climatology, Geographical Information Sciences, Computational Meteorological Model

Daichi NAKAYAMA    Assistant Professor / PhD (D.Sc.)
Geographical Information Sciences, Remote Sensing, Computational Geomorphology

2) Overview of Research Activities

This laboratory is going to study the natural environment as a whole which is composed of geomorphology, climate, hydrology, vegetation, and so on. Concretely, deductive approach and inductive approach are combined for conducting studies. The former approach is going to explain results from causes by physical lows such as mass balance, energy balance, equation of motion, and so on. The latter approach is going to explain facts demonstratively based on field surveys and in situ observations. Therefore, collection of quantitative data, digital mapping, statistical analyses and numerical modeling are main methods used in this laboratory.

The main study themes in this laboratory are listed as follows.

- Energy and water cycle in the atmosphere and hydrosphere
- Capturing snow distribution and snow water resources, along with snowmelt-runoff based on the remote sensing techniques
- Quantitative evaluation of spectral reflectance characteristics of coniferous forests, along with the quantitative evaluation of their leaf area indices.
- Hydrological cycle around Mt. Aso and Tokyo Metropolis
- Numerical simulation of the urban heat island
- Capturing surface conditions of cities such as albedo, roughness length, and evaporative fraction
- Estimating landslides based on digital elevation model, remote sensing, and data mining techniques
- Flood monitoring in Bangladesh based on remote sensing and geographical information systems
- Monitoring urban environment and natural environment by using synthetic aperture radar
- Precise geometric correction of satellite images
3) List of Research Activities in 2006

Peer-reviewed Articles


Other Articles


Hoque, R., Nakayama, D. and Matsuyama, H. 2007. Flood monitoring in the Meghna river basin in

Presentations at International Conferences


6 Laboratory of Urban and Human Geography

1) Staff

Yosio SUGIURA  Professor / PhD (D.Sc.)
Human geography

Toshio KIKUCHI  Associate Professor / D.Sc.
Agricultural and Rural Geography, Regional Geography of Oceania, Nature Based Tourism

Yoshiki WAKABAYASHI  Associate Professor / PhD (D.Sc.)
Urban geography, Behavioral geography, Geographic information science

Yuko TAKEDA  Assistant Professor / Ph. D.
GIS, Urban geography

Hiroyuki TSUBOMOTO  Assistant Professor /
Urban geography, Office study

Michiko HARAYAMA  Assistant Professor /
Bibliometrics

2) Overview of Research Activities

This research unit specializes in human geography, with special emphasis on the city and its environs. Our research interests center on the structural explanation of the relationship between human activities and geographic environment by employing approaches of social sciences and humanities. Methodologically, the emphasis lies largely on positivistic (viz., quantitative or mathematical); fieldwork is also encouraged. The research interests cover quantitative, socioeconomic, urban and behavioral geography. The main themes of our current research are as follows:

1. Mathematical modeling of human geographic phenomena
2. Regional analysis of human geographic phenomena
   1) Relationship between human activities and geographic environment
   2) Land use change in the city and its suburbs
   3) Spatial organization of the society
   4) Transformation of human activities brought about by environmental change
3. Geographical studies of urban systems
   1) Spatial structures of intra-urban system
   2) System of cities

4. Geographical thought
   1) History of modern geography
   2) Bibliometric research of geographical studies

3) List of Research Activities in 2006

Peer-reviewed Articles

Other Articles
Kikuchi, T. 2006. Sustainable development of organic vegetable food system with creating social capital in the outer fringe of Tokyo metropolitan area. *Geographical Reports of Tokyo Metropolitan University*, 42, 76-83.

Books
Kikuchi, T. and Inui, T. eds. Rethinking and Relearning on Forest. Ninomiya Publisher, Tokyo, 190p.

Reports
systems of Japan with regard to farm successors. Tsukuba Univ., Tsukuba, 306-309.


Book Review

Miscellaneous reports


Presentations

Kikuchi, T. 2006. Environmental issues in Australia; rethinking on the relationships between human activities and physical environment. Super Science Programs in Utsunomiya High School, Utsunomiya.


