

## Human Impacts on Subsurface Environments

How do human beings develop and sustain urban areas where population is increasing and concentrating rapidly? We will address scenarios of future development by reconstructing changes in urban environments, and evaluating the effects of humanity and climate changes. Subsurface environmental indexes will be used for evaluating environments of (a) water, (b) heat, and (c) material, which are necessary for human beings such as food, energy and health.

PROJECT LEADER ■ **TANIGUCHI, Makoto** — RIHN

CORE MEMBERS ■ **ADACHI, Itsu** — Global Environment Department, JICA

**EHARA, Sachio** — Graduate School of Engineering, Kyushu University

**FUKUDA, Yoichi** — Graduate School of Science, Kyoto University

**KANEKO, Shinji** — Graduate School of International Development and Cooperation, Hiroshima University

**KITAGAWA, Hiroyuki** — Graduate School of Environmental Studies, Nagoya University

**NAKANO, Takanori** — RIHN

**ONODERA, Shin-ichi** — Faculty of Integrated Arts and Sciences, Hiroshima University

**SHIMADA, Jun** — Faculty of Science, Kumamoto University

**YAMANO, Makoto** — Earthquake Research Institute, University of Tokyo

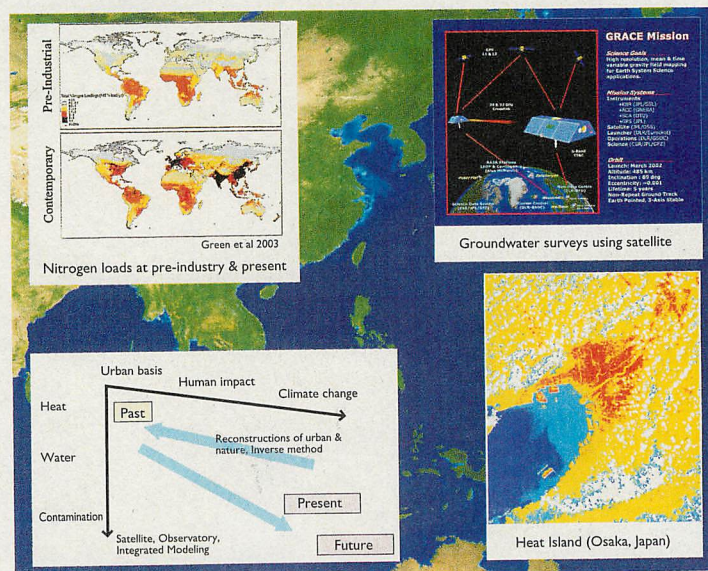
**YOSHIKOSHI, Akihisa** — College of Letters, Ritsumeikan University

Securing water resources and clearing contaminated water caused by human activities in urban areas are global environmental issues in the 21st century. Heat island phenomena created by human activities are also a big environmental problem in addition to global warming. These global environmental issues that are caused by urbanization, should be addressed strongly and prevented, because population increase and concentration is occurring rapidly in urban areas.

This project will suggest better models for future development for human beings by reconstructing changes in urban environments (from present to past), and by developing integrated nature-social models (from past, present to future). Subsurface environmental indexes will be used from the points of view of (1) climate changes, (2) human impact, and (3) stages of

urban development and social policies. Water, heat, and material environments will be evaluated by investigating changes in groundwater resources using satellite data, reconstructions of climate changes and urbanization using subsurface thermal regimes, evaluations of contamination from preserved subsurface indexes.

Expected results of this project are evaluations of; (1) the relationship between urbanization and heat island phenomena, (2) changes in groundwater resources and its effective uses, (3) origins of contamination and pass ways of contaminants from land to ocean, (4) the relationship between stages of urban development and long term changes of environments mentioned above. This project will be partially advised by international projects such as UNESCO-GRAPHIC, GWSP, and IGBP - LOICZ.



We will evaluate urban environments using various subsurface environmental indexes.