

BAHC

BAHC Related Japanese Projects

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BAHC related projects in Japan

The latest information of BAHC from the BAHC Core Project Office in Berlin received in November 1992 tells us the following four main subjects and aims of the project;

- 1) Land-atmosphere interface processes and related phenomena,
- 2) Cycling of water over continents,
- 3) Experiments and modeling from patches to regions, and
- 4) Global assessment of land surface properties and of their long-term changes for global modeling of the effects of changes in the biosphere on the hydrological cycle.

International hydrological projects in Japan have been conducted in relation to the IHP-IV by UNESCO. The selected topics are Project H-4-2: Snow and ice hydrology in specific areas and regions with special attention to long-term variations in water storage, and Project H-5-1: Hydrologic research and water resources management strategies in the humid tropics and other warm humid regions.

The BAHC also aims at elucidating the hydrological cycle with emphasis on the role of biosphere. Two Japanese projects under way in relation to the IHP-IV are also closely related to the BAHC. Relation between IHP-IV, BAHC, and IHP and/or BAHC related Japanese projects are shown below.

IHP-IV Project	Japanese project	Contribution to BAHC's aim
H-4-2	CREQ Project	1), 2), 3), 4)
H-5-1	SAHC Project	1), 2)
	TABLE Project	1), 3)

CREQ Project (Cryosphere Research on Qingzang Plateau)

Tibetan Plateau (Qingzang Plateau) is a vast high altitude plateau which is said to have strong effect on regional climate of East Asia and Western Pacific, and to general circulation and global climate formation. Many types of ground surfaces from bare ground to grassland to well vegetated surface exist on the Plateau. However, cryosphere components, such as glaciers, permafrost and snow cover exist at wide range of time and space scale, and they have essential effect on the surface water balance, water circulation and thermal balance at the surface. Main aim of the study is to clarify the role of cryosphere to the water circulation and heat budget in this region, considering the variation of the surface conditions.

The present study will concentrate on investigations of the following main topics;

- 1) Annual and interannual variation of all components of water circulation in a glaciated drainage area,
- 2) Characteristics of processes related to evaporation and surface heat fluxes of the soil-vegetation-atmosphere system under permafrost condition,
- 3) Relation between observed surface conditions and satellite data, and
- 4) Land surface-atmosphere interaction especially in relation to surface variation.

Field observation study will be the main method of study, supported by model simulation study and satellite image analysis. The whole study period is from 1992 to 1996, but the intensive field study will be made in the former half of this period.

The field study consists of two spatial scales. One is the area along the Qingzang Highway (scale order of 1,000 km), from Golmud to Lhasa on Tibetan Plateau. Another is Tanggula Mts. area located at the center of the Plateau where three drainage areas (40 to 4,500 km²) are selected and main hydrological, glaciological and meteorological measurements will be done. The observations are mainly made by automatic recording system which has been operating since 1989.

The leader of the CREQ Project is Professor Y. Ageta at the Water Research Institute, Nagoya University, Nagoya 464, Japan.

SAHC Project (South Asia Hydrological Cycle Project)

The main objective of this project is to develop a methodology for field investigation of the hydrological cycle at meso to macro scale by using various means. A methodology of using environmental tracers to investigate the local water cycle in heterogeneous real world was developed in Japan and the methodology was successfully applied to the Island of Bali, Indonesia (Kayane, ed., 1992). The environmental tracers used are heat, tritium, deuterium and oxygen-18. Small annual change of the subsurface temperature and existence of distinctive water with different stable isotope ratio in the humid tropical climate make the use of environmental tracer techniques very effective. The Island of Bali has a spatial scale of the order of 10 km. The SAHC Project aims at scaling-up the methodology applicable to the hydrological cycle of the order of 10^2 to 10^3 km through field survey in Sri Lanka and India.

Two topics are intensively investigated in the field; one is isotope hydrological study and the other is climatological study.

It was clear from the field study in Bali that isotopically distinctive waters could be used to elucidate hydrological processes including atmospheric phenomena such as evaporation and precipitation in the tropics where evaporation rate is higher than in the middle latitude zones. In Sri Lanka where the contrast of dry and wet climatic conditions exists caused by monsoon activity, that is in the middle western part of Sri Lanka where drastic changes of landscape are seen from the dry zone to the wet zone, we can investigate surface processes of water exchange under different climatic controls within an areal range of 100 km. In India, the Deccan plateau will be our study field where recycling of evaporated water as precipitation within the same region will be investigated by using stable isotopes of water.

One of the most prominent phenomena related to the hydrological cycle in South Asia is Indian monsoon. Among many issues which might be related to the global change, we mention here just one issue in Sri Lanka as an example. The annual rainfall at Nuwara Eliya has been decreasing for more than one hundred years, whereas the Mahaweli Ganga (the biggest river in Sri Lanka) monthly discharge at Peradeniya during the south-west monsoon season has been increasing for the past fifty years. If these two phenomena are real, and they are based on information obtained from real world conditions, then there should be processes which can connect these two phenomena as a cause-effect relation or as a result of ocean-air-land interactions with feed-back from human activities. If we will be able to elucidate the processes which link these two phenomena, and if the revealed processes are the essential ones in the Earth System, then we will get to know the Sri Lankan contribution, including land surface changes by anthropogenic agent, to the Earth System. This will be a case of scaling-up of local phenomenon to global one (Kayane, 1992).

The project leader is Professor I. Kayane at Institute of Geoscience, University of Tsukuba, Ibaraki 305, Japan, and the project period presently funded is 1992-1994.

TABLE Project (Tsukuba Atmospheric Boundary Layer Experiment Project)

One of the major concerns in current hydrology is the lack of information on how to aggregate and/or disaggregate various surface fluxes such as heat, momentum and water vapor from one scale to another. Such knowledge is essential to make use of existing and accumulated data sets and findings from many previous small-scale hydrologic studies, in a different scientific field such as atmospheric sciences where scales of problems are somewhat different. This project was organized to shed a light on this topic.

A three-week intensive field campaign took place in the summer of 1992 at and around Tsukuba, Japan. The generally flat 16 km by 16 km experimental area can be characterized by the complexity of its surface land cover that includes various crops, pine tree woods, dotted houses and buildings, paddy fields, and so on. Except for the paddy fields which extended along the rivers, horizontal scale of each surface type was typically of the order of 10^1 to 10^2 m. Five flux stations installed at all major surface types in the area, allowed determination of the local scale surface fluxes, while atmospheric profilings by means of a 200-m meteorological tower, a tethered balloon, and a radiosonde are expected to yield the regional (10^3 - 10^4 m) mean fluxes.

An initial analysis of part of the data sets acquired during the campaign in the summer of 1992 produced some interesting and promising findings to address scale problems in the studies of the land-surface/atmosphere interface (Sugita, M. et al., 1993; Sugita, M. et al., 1992), although it is clear that more researches are needed to draw any concrete conclusions.

The project leader is Professor I. Kayane, and many hydrologists and climatologists from the University of Tsukuba and other universities and institutes are participating in the project. The project period is 1992-1996.

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