GRANDE
News Letter

Volume 1, June 2012

Message from the Project Leader

Tohoku University and San Andres University are in the third year of the GRANDE (Development of Adaptation Model for Water Resources Management Tackling Glacier Retreat) project, which officially started in April 2010. The project proceeded under the SATREPS program (Science and Technology Research Partnership for Sustainable Development) supported by the JST (Japan Science and Technology Agency) and JICA (Japan International Cooperation Agency). We thank all other domestic and Bolivian cooperative partners and related agencies for their support. Our activities will be reported in the GRANDE News Letter.

Many countries are facing an urgent need to plan for adaptation to a changing climate. For its part, Bolivia needs to adapt its water resources management to a changing climate because glacier, which is a main water resource in the cities of La Paz and El Alto, has decreased over the last several decades due to climate change.

Project objectives are to develop an assessment model for water resources management and to provide scientific knowledge of climate change impacts on water resources to Bolivian water-related organizations. We also place an emphasis on the development of human resources for Bolivian water management through collaborative activities. Since water issues in relation to a changing climate are long-term rather than short-term challenges, Bolivian researchers need to identify sustainable actions for climate change adaptation. As part of the project, Bolivian researchers will join the Japanese study team to learn how to apply the model for water resources assessment. Following completion of the study, the Bolivian researchers are expected to update our assessment model and expand its application to more areas.

We strongly believe that this collaborative activity will help water resources planning for climate change in Bolivia and for sustainable water resources management in the future.

Hitoshi TANAKA
Professor of Engineering
Tohoku University

SATREPS For the Earth, For the Next Generation

Activity Report

Field Survey in Bolivia, Dr. Seiki Kawagoe, Fukushima University

I stayed in Bolivia from 12 to 20 March 2012 for collaborative activity related to the GRANDE project, and my second visit since my stay there in May 2010. I took care of altitude sickness because I had not been able to complete during the first visit. Even though I suffered from headache during this second trip, I was able to recover after only a short time, and so we were able to accomplish the initial schedule as described below:

(1) field survey in the Tuni basin
(2) briefing of international students
(3) presented the research progress to the Environment Ministry in Bolivia
(4) survey of a landslide in La Paz

In the Tuni basin, my interest was the soil conditions during the rainy season because a large part of the annual soil production is generated in the rainy season. Although I found dry soil conditions due to an early end to the rains, there were still many pools on the mountain road—our vehicle became stuck in them for as long as an hour during the field survey.

We used a microscope to observe the main components of the soil in some areas, and we analyzed slope features in each small basin. Gully erosion varied greatly depending on the surface flow; in particular, grass on the slope prevented gully erosion. Based on our findings we suspect that sediment flow may change due to glacier retreat. We should consider the relationships among glacier retreat, vegetation growth, and soil erosion to improve the sediment flow model; remote sensing analysis may be useful to understand the historical relationships involved.

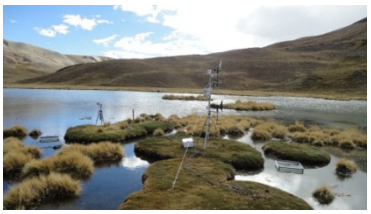
Since our activity in Bolivia will continue to be limited due to time and physical strength, we need to cooperate more closely with a Bolivian counterpart. We will strengthen our collaboration to accomplish the objectives of the GRANDE project.

GRANDE Café

GRANDE café (G café) is a voluntary activity by a Bolivian researcher with the objective of providing opportunities for researchers, students, technicians, and stakeholders to discuss the adaptation of water resources management to changing climatic conditions from different perspectives. G café has been held twice so far at San Andres University, and Japanese researchers were invited to present case studies of climate impacts on water resources in Japan. Dr. Asaoka, Tohoku University, gave a presentation on the relationship between climate variability and river discharge in a Japanese snow-covered area in the the first G café in December 2011. Dr. Kawagoe, Fukushima University, also gave a presentation on rainfall-induced slope failure in Japan and Bolivia in the second G café in March 2012. In both presentations, discussions focused on the uncertainties of climate change. G café will be held regularly in the future for promoting the understanding of water management and water issues.

GRANDE Students

Fabiola Ledezma, Tokyo Institute of Technology



My name is Fabiola Ledezma, and I am from Bolivia. Since September 2010 I have had the opportunity to continue my studies to obtain a Master's degree in Dr. Kinouchi's laboratory within the Environmental Science and Technology Department at the Tokyo Institute of Technology. I would like to sincerely thank the JST/JICA SATREPS, and the GRANDE project for giving me the chance to improve my professional knowledge and skills.

One of the main objectives of my Master's thesis is to apply a distributed hydrological model to a catchment in the Bolivian Andean region, under the supervision of Dr. Kinouchi. We used a water and energy transfer processes (WEP) model, which takes into account the spatial variation of all the physical variables and parameters involved in the basic water flow equations for watersheds. The WEP model was developed in Japan and has been applied to many catchments throughout Asia. My challenges are to improve the model and to obtain model parameters for two basins in Bolivia, the Condoriri River basin and the Huayna Potosi River basin. These two basins have an unusual environment, consisting of glacier, semi-arid areas, and wetlands, and are the main sources for drinking water in the cities of La Paz and El Alto. We need to update the WEP model to an appropriate design for our basins. Bolivia has adopted several hydrological models for water resources management, which had been developed in advanced countries. However, they had not been improved for our basins. My experience in Japan is a new approach for Bolivia.

In 2011 two field studies were conducted in our basins with other members of the GRANDE project, in April (end of the wet season) and September (end of the dry season). The initial task of the studies was to consider a proper method to calculate evaporation rates in the study area and to collect meteorological data and energy fluxes to evaluate methods of estimating evaporation. Initially two methods were used: (1) Bowen Ratio Energy Budget (BREB), based on the Bowen ratio similarity and the energy balance equation, and (2) Eddy Covariance, based on analysis of individually sensed turbulent fluctuations. Both techniques allowed us to estimate the fluxes of energy (sensible heat) and mass (evaporation) from the surface. Although the two techniques share many of the same hydrodynamic assumptions, their measurement and sampling protocols are different. Thus, the Eddy Covariance technique provided an independent means to check sensible heat, which is computed indirectly with the BREB technique. Consequently, we confirmed the BREB method results. However, the BREB method requires information that is difficult and expensive to obtain for long-term analyses. Thus, we needed to find a simplified method that showed similar results to the BREB method. After applying and comparing many other methods, we concluded that the Penman and Priestley–Taylor methods gave the best results. Hence, they can be applied to calculate the evaporation rate of our study area.

As a final task, we used the information that had been collected, generated, and analyzed to calibrate the hydrologic model under actual conditions. This calibrated model can be applied to climatic conditions with a general circulation model (GCM) dataset, allowing us to evaluate possible future conditions for water resources. Moreover, the final results of this research will help us to understand the contribution of each component, such as glacier water and groundwater, to lower altitude discharges.

In addition to my research contribution to this project, I expect to have the opportunity to transfer this acquired experience and knowledge to future generations in my country.

Thanks a lot!

Publication List From June 2009 to March 2012

Journal

- Syunsuke MIYATA, Yoshihiro ASAOKA and So KAZAMA, 2012: Verification of degree-day method and snowmelt rate factor in AMeDAS points over Japan, Journal of Japan Society of Civil Engineers, Ser. B1 (Hydraulic Engineering), Vol. 68, pp.I_343-I_348 (in Japanese).
- Syunsuke KASHIWA, Yoshihiro ASAOKA and So KAZAMA, 2012: Estimation of snowdepth distribution in mountainous area by assimilation of snowdepth data, Journal of Japan Society of Civil Engineers, Ser. B1 (Hydraulic Engineering), Vol. 68, pp.I_331-I_336 (in Japanese).
- Liu, T. and Kinouchi,T., 2012： Water Balance of Glacerized Catchments in Tropics: A Case Study in Bolivian Andes, Journal of Japan Society of Civil Engineers, Ser. B1 (Hydraulic Engineering), Vol. 68, No. 4, I_247-I_252.
- Megumi WATANABE, Kazunari NAKANO, Yukiko HIRABAYASHI, Seiki KAWAGOE, Yoshihiro ASAOKA and Shinjiro KANAE, 2012: Estimation of the tropical glacier in Bolivia using satellite imagery, Journal of Japan Society of Civil Engineers, Ser. B1 (Hydraulic Engineering), Vol. 68, pp.I_307-I_312 (in Japanese).
- Yoshihiro Asaoka and Yuji Kominami, 2012: Spatial snowfall distribution in mountainous areas estimated with a snow model and satellite remote sensing, Hydrological Research Letters, Vol. 6, pp.1-6. DOI: 10.3127/HRL.6.1.
- Makoto OKUMURA and Hiroshi TANAKA, 2011: Statistical analysis of operation and maintenance cost of network infrastructure -Municipal water supply systems in Tohoku region-, Journal of the City Planning Institute of Japan, Vol. 46, pp.373-378 (in Japanese).
- YOSHIHIRO ASAOKA, YUKARI TAKEUCHI and SO KAZAMA, 2011: Temporal variation in acidity and ion concentration of snowmelt water in light and heavy snow years, IAHS Publication 346, pp.86-91.
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- Shunsuke KASHIWA, Yoshihiro ASAOKA and So KAZAMA, 2011： Assimilation of snow depth date into snowmelt-runoff model, Annual Journal of Hydraulic Engineering, Vol. 55, pp.S403-S408 (in Japanese).
- Freddy ORIA, So KAZAMA, 2011: POTENTIAL IMPACTS OF CLIMATE CHANGE ON THE ROPICAL ANDES, Annual Journal of Hydraulic Engineering, Vol. 55, pp.S79-S84.
- D.H. Nam, K. Udo and A. Mano, 2011： Flood Forecasting and Early Warning for River Basins in Central Vietnam, Annual Journal of Hydraulic Engineering, vol. 55, pp.S7-S12.
  M. Farid, A. Mano and K. Udo, 2011: Modeling Flood Runoff Response to Land Cover Change with Rainfall Spatial Distribution in Urbanized Catchment, Annual Journal of Hydraulic Engineering, Vol. 55, pp.S19-S24.
- Yoshihiro ASAOKA, Yasushi TOYODA and Yukari TAKEUCHI, 2010: The effect of the precipitation form discrimination method on river discharge estimation during winter, Annual Journal of Hydraulic Engineering, Vol. 54, pp.421-426 (in Japanese).
- Freddy SORIA and So KAZAMA, 2010: EVALUATION OF THE EFFECTS OF AN EL NINO EVENT ON GLACIER MELTING RATE, Annual Journal of Hydraulic Engineering, Vol. 54, pp.25-30.

Award

- Yoshihiro ASAOKA, May 2010
  Technical Development Award, Tohoku Branch, Japan Society of Civil Engineers
  Effect of the precipitation form discrimination method on river discharge estimation during winter

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