GRANDE
News Letter
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To the Next Step

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Time flies like an arrow. Now the GRANDE project under the SATREPS program supported by the JST (Japan Science and Technology Agency) and JICA (Japan International Cooperation Agency) has been in the final year. As a member of water quality grope, I have visited Bolivia for three times to collect water sample from the major streams of Condoriri and Huyna Potosi basins as well as Tuni Lake basins in various season. A sublime landscape of those glaciers under deep sky blue is quite attractive and impresses me every time. Therefore, it was very shocking when I found the glacial retreat in these three years actually by myself.

Toward the end of the project period, great efforts have been made to establish an assessment model for water resources management and a user manual for the model. Using the model developed, Bolivian water-related experts and organizations are expected to make appropriate decisions and actions against to possible water shortages due to glacial retreat with climate change.

Considering need of technical countermeasures required to actions for climate change adaptation near future, long-term collaborative activities post GRANDE project will be desired. Climate change is a phenomenon that affects the entire world. Development of practical countermeasures is world common issue for adaptation to global warming. From this viewpoint, I wonder if some technical cooperation concerning adaptive countermeasures to global warming can be established between Japan and Bolivia.

Particularly, considering both available water predicted by the model simulation of glacial retreat and current situation of drinking water restrictions in La Paz and El Alto, development and introduction of sustainable water reuse process in this area would be urgent. I expect great efforts would be paid not only to complete the GRANDE project, but also to make an opportunity to start a post GRANDE project during several months left till the end of this project.

Photo: At the Ministry of Environment and Water, Bolivia in May, 2010

Activity Report

Training course of water quality group, Dr. Umeda, Tohoku University

From January 20th through 24th, 2014, training course of water quality group was held in Sendai. During that occasion, three Bolivian members of our team came to Japan: Dr. Espana, Mr. Bellot, and Mr. Gorritty. The most important purpose of the training this time was to complete the first draft of the documentation on the water quality model of Tuni Lake, whose projection on future water quality is one of the objectives of our project.

Umeda explained the latest achievement of the model improvement regarding heat balance estimation in the reservoir. Evelin Humerez made presentation on her current research on water quality formation processes in the Condoriri River watershed. Keisuke Tani explained the input and output data of the model. With those lectures, the Bolivian team wrote the document enthusiastically for the rest of the period in the first three days.

On the fourth day, we went Miharu Dam and Arai water purification plant of Koriyama City as a technical tour. Mr. Gorritty was quite interested in the environmental measurements conducted around the reservoir by the Miharu Dam office, and Dr. Espana and Mr. Bellot were attracted by the particle removal system used in the water purification plant.

On the final day, the Bolivian team made a briefing on the document accomplished during the week. The model manual is composed of two parts: (I) Theories on water quality modeling in reservoirs, and (II) User guide of the model code. We shared the manuscript, which was satisfactorily written. This document is to be completed in June

Photo: Discussion on the data preparation of the model between Bolivian and Tani.

Photo: Lecture on reservoir water management at Miharu Dam

Training course of glacier melt model, Dr. Asaoka, Tohoku University

We held training course of glacier melt model on February 26th and 27th, 2014 at IIDEPROQ-UMSA, LaPaz, Bolivia. One of the main aims of GRANDE project is technical transfer of model for adaptation of water management to climate change. Six researcher at UMSA and one technician at SENAMHI, National Service of Meteorology and Hydrology, participated this course. We had compiled user's guide of glacier melt model for the description.

First, Mr. Fuchs explained the design of glacier melt model. He had completed Master course of Tohoku University in September, 2013 and had developed the model applicable for Andean tropical glacier in his master thesis. Second, Asaoka explained the latest research result regarding future projection of glacier with climate change. Third, Asaoka and Fuchs explained how to execute the model and its

Photo: Lecture on glacier melt model

configuration. Finally, trainee address exercise of model, which topic is estimation of glacier response to environment change. Mr. Yoshizawa, student at Tohoku University, also partially assisted for the seminar.

Glacier melt model was developed during the period of GRANDE project. However, it requires further improvement for long-term operation after project because adaptation of to climate change and glacier retreat is continual issue. Important thing is for Bolivian researcher to operate and maintain the model by themselves.

Photo: Practice of glacier melt model

GRANDE Students

Gabriela SOSSA LEDEZMA, Master course student, Tohoku University

I am glad to have this opportunity to share my research experience with all the members of Grande Project. My name is Gabriela Sossa Ledezma; I was born in La Paz, Bolivia. I studied Civil Engineering at Mayor de San Andres University. Currently, I am studying for my Master's degree at Tohoku University. I belong to the Sediment Group where my advisor is Prof. Hitoshi Tanaka. Our team is committed to the assessment of the sediment deposition phenomenon in Lake Tuni by a mathematical model.

Photo: Gabriela Sossa Ledezma

I am living in Japan for almost two years, time in which I enhanced my understanding in the sediment transport processes by rivers and its intrinsic relationship with the sediment yield by the catchment. I did not have research experience in this field before, but the knowledge that I acquired as an undergraduate student in my university help me to overcome that situation, along with the continuous and valuable support from my advisor Prof. Hitoshi Tanaka and other professors from department of Civil Engineering.

Mostly, in my country, the estimation of sediment transport rate and sediment deposition rate is carried out through empirical equations that derived on a rough estimation and almost none data from sediment gauge stations is available. More developed techniques such as a mathematical model require observed data for its validation. Therefore we sought for different techniques to overcome the lack of data in Lake Tuni. The comparison of high resolution topographical measurements with a 3D laser scanner from

Photo: Measurement of sediment deposit in Tuni reservoir and 3D laser scanner

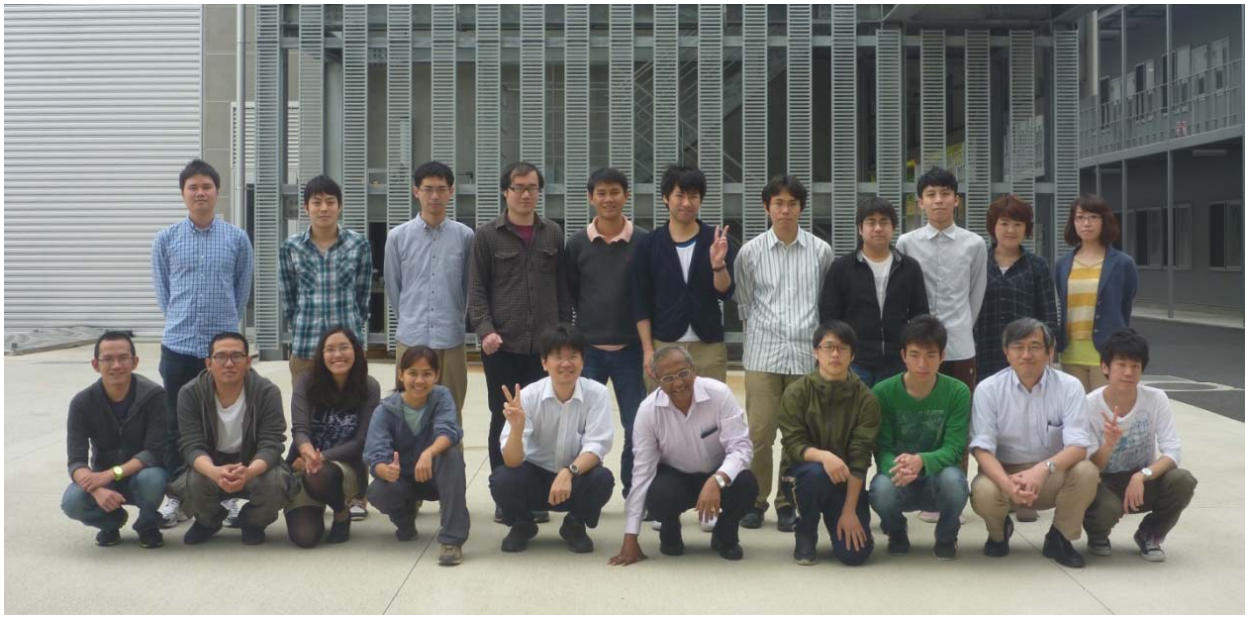

Photo: Prof. Tanaka's laboratory

different periods was the method selected to obtain the already mentioned sediment deposition rate.

Thus on October 2013, I carried out field observations in the sediment deposits in Lake Tuni. Some of the achievements were; the topographical and bathymetry measurements; the collection and analysis of soil samples, defining the mechanical composition of the sediment; the establishment of fix points where to reference coordinates and altitudes and the acquirement of past topographical measurements done in the sediment deposit of Tuni River with the 3D laser scanner. None of these goals could have been reached without the tremendous support of Ing. Yuko Okamura, the coordinator of the Grande Project in Bolivia. I found the stage of fieldwork very important, not only I reached crucial goals but also I have learned to operate cutting edge devices such as: the 3D laser scanner, a high definition sonar system and a differential GPS.

Through the topographical comparison between 2012 and 2013 was obtained that the difference of volume among both periods is 120 [m3]. Therefore the rate of sediment deposition is 120 [m3/year]. This value is accepted as a preliminary result because is very close to 76.7 [m3/sec], the sediment yield of Tuni catchment area reported by Kawagoe (2012). Furthermore Kawagoe (2012) reported future predictions of total sediment yield in Tuni catchment area. Applying that trend line was estimated the future predictions of sediment deposition. The predictions show a decreasing rate on the sediment deposition, precipitation is the main factor that influences this tendency as it might decrease due to climate change.

The mathematical model of sediment transport and deposition was made based on the approach of Tanaka & Huimin (1987). This consists of two parts: the hydrodynamic model and the morphological model. The hydrodynamic model is composed by the equation of continuity and the equation of motion. And the equation for the morphological model is the conservation equation of sediment mass. Our final objective is to validate this mathematical model for Lake Tuni. Using the rate of sediment deposition reported for the period 2012-2013 and a new one that will be obtained through a topographical measurement this year that will correspond to the period 2013-2014.

As a final statement I would like to express my greatest gratitude to JST/JICA, SARTREPS (Science and Technology Research Partnership for Sustainable Development) for supporting financially this study. I strongly desire to apply all the knowledge that I have learned in future research projects for the benefit of my country.

Publication List
2013.04-2014.03

Journal

- Moya Quiroga, V., Mano, A., Asaoka, Y., Kure, S., Udo, K. and Mendoza, J., 2014: Glacier ablation and water resources in tropical Andes, Journal of Japan Society of Civil Engineers, Der. B1 (Hydraulic Engineering), Vol.70, No.4, pp.I_229-I_234.
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Conference Proceeding

- Evelin Humerez, Makoto Umeda 2013: Influence over Water Quality due to Nutrient Loading in the Royal Range of the Andes. Proceedings of 2013 IAHR World Congress, CD-ROM A10578.
- Vladimir Moya Quiroga Gomez, Akira Mano , Yoshihiro Asaoka, Keiko Udo, Shuichi Kure, and Javier Mendoza, 2013: Hydrological Modelling of a Glacierized Andean Basin Using the Semi Distributed Model Supertank. Case: the Andean Basin. Proceedings of 2013 IAHR World Congress, CD-ROM A10575.

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