Impact of climate change on water quality: a Himalayan case study

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Introduction

Water quality is an essential issue for the inhabitants around the Himalayan area, particularly in the situation of climate change. Since Tibetan Plateau is the "Water Tower" of Asia, ten of the largest rivers in Asia (e.g. Yangtze River, Yellow River, Salween, Indus etc.) originate from the plateau, providing water to about 40% of the world’s population. In this work, water quality in the headwaters of major Asian rivers draining in the TP as well as lakes on north and south sides of the Himalayas were studied (Fig. 1).

Achievements

- Ice core study — an increasing temperature happened over the last 500 years
- Waters study in rivers and lake of Tibetan Plateau — atmospheric pollution from surrounding areas could affect the water quality. Some elements (such as arsenic) concentrations in rivers were higher than that of WHO guideline for drinking.
- Climate change on water quality — stream water emanating from one glacier of Tibetan Plateau showed that Ca²⁺, HCO₃⁻ and SO₄²⁻ are the key ions in stream water throughout the ablation season, and the water chemistry are affected by temperature significantly.

Objective

The aim of the project is to investigate quality of waters (rivers i.e., the Brahmaputra, Indus and the Ganges), lakes and precipitation) on Himalaya region of Tibetan Plateau in the background of climate change (Fig.1).

Method

Sample collection

Rivers

Lake water

River water

In situ measurement

Lake water

River/lake water samples & lake sediment samples

Climatic factors

Laboratory analysis (major ions, heavy metals, PAHs)

To establish the foundation of using water quality parameters as indicators of climate change

Real-time monitoring system

Publications

Sharma, C.M., Kang, S., Sillanpää, M., Li, Q., Zhang, Q., Huang, J., Tripathpee, L., Sharma, S. and Paudyal, R., Mercury and selected trace elements from a remote (Gosainkunda) and urban (Phewa) lake waters of Nepal, submitted
Zhang, Y., Kang, S., Grigholm, B., Kaspari, S., You, Q., Qin, D., Mayewski, P., Zhang, Q., Huang, J., Cong, Z., Sillanpää, M. and Chen, F., Atmospheric dust deposition retrieved from a Mt. Geladaindong ice core, central Tibetan Plateau, manuscript
Xiangying, L., Dahe, Q., Zhenghua, C. and Sillanpää, M., An improved model-based spatial variation of δ18O in precipitation over China, submitted
Xiangying, L., Yongjian, D., Zhao, L., Sillanpää, M., Shiyin, L., Glacier hydrochemical processes and solute provenance at the Hailuogou basin, eastern Tibetan Plateau, submitted

Fig. 1 The location map of study areas over Himalayan regions