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### **Downstream effects of ice/snow dynamics under changing climate**

HMA glacial meltwater is an important supplement to naturally occurring runoff from precipitation and snowmelt, and could influence regional water security and ecosystem services. The glaciers of the region are found in the headwaters of several great river systems in Asia, which are the main source of drinking water and irrigation supplies for those watersheds. One of the complex global change issues in broad downstream areas of High Mountain Asia (HMA) is the spatial connection among climate change, alpine glacier/snow dynamics, and downstream impacts on water resources and ecosystems. The changes of hydrological regime and increased extreme events related to retreat of glacier in turn lead to major impacts on crop yield and livelihood in those communities and beyond in lowland areas. Multiple satellite based regional assessment is critical for better understanding the patterns and mechanisms of those complex connectivity.

High quality spatial datasets of key climate and land surface parameters are essential for understanding the impacts of climate change on glacier melt and downstream ecological and hydrological processes, as well as possible feedback of these processes to regional climate. However, great potential of new generation satellite data have not been fully considered in examining climate change and glacier dynamics in HMA region, while major data gaps remain. This study will examine spatial datasets of key water and ecosystem parameters, and to explore the potentials of multiple earth observation satellites in understanding downstream effects of ice/snow dynamics on water resources and ecosystems under changing climate over the region. Key science questions are: 1) What are the potential impacts of changes in climate and glaciers on the volume/level of surface water in downstream region; 2) What are the potential impacts of changes in climate and glaciers on primary production and fractional cover of ecosystems in downstream region; and 3) What are the likely implications for extreme climatic and hydrological events such as floods and drought?

This project will investigate the spatial patterns and temporal changes of various surface water and ecosystem parameters, including water level, surface water area/volume, vegetation production, and fractional cover using multiple satellite data products and climate data. It will also examine the impacts of climate change and ice/snow melt on downstream ecological and hydrological processes, along with impacts of extreme events on ecosystem dynamics.