



Snow and Glacier Monitoring System

Summary

Glaciers and seasonal snow cover in the Jinsha River Basin (JRB) are important components of the water cycle. Therefore, the state and changes of glaciers and seasonal snow cover as well as their spatial distribution and temporal contribution/proportion to the water resources allocation in the JRB have to be investigated.

This research contains terrestrial glacier monitoring and satellite-based snow cover monitoring. The results will improve the understanding of the status and dynamics of different factors such as snow melt, glacier melt, droughts, floods, and their impacts on the water resources in the JRB

Objective

- Monitoring of relevant factors which determine the water dynamics and runoff regime of the Jinsha River in different physiographic regions.
- Implementation of direct and fully automatic monitoring of glacier change on Yulong mountain.
- Examining the relationship between snow covered area and runoff volume.

Approach

- Based on the analysis of the current monitoring network and the field investigations, an automatic terrestrial monitoring station was designed and installed.
- Time series of remote sensing imageries have been used to estimate the snow covered area.
- The Snow Runoff Model (SRM) is applied to simulated streamflow from snowmelt at the source of Yangtze River.



Results and Outcomes

Terrestrial Monitoring Station

In September 2016, the glacier observation station has been installed on Yulong Snow Mountain (see Fig. 1). The station is located at approx. 4'600 m a.s.l with a panorama view of the tongue of glacier No. 1.



Fig. 1: Installation site of glacier monitoring station

The system contains state-of-the art sensors and communication tools. The station is equipped with webcams to measure the glacier movement, and a weather sensor. The weather sensor measures temperature, wind, humidity and precipitation.

The fully automatic data transfer is done via GSM data transmission and satellite communication. The monitoring data is collected, displayed and accessible on an online data platform (Fig. 2).

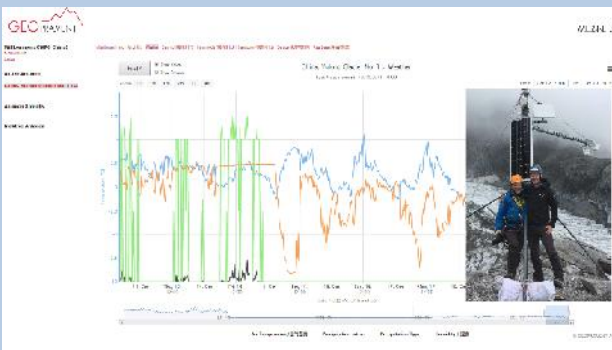


Fig.2: Station and online data platform

Satellite based Monitoring System:

The study area covers the source of Yangtze River (above Zhimenda Station) with an average altitude above 4'000m a.s.l. Due to the large elevation difference, the research area was divided into 6 elevation zones (see Fig. 3).

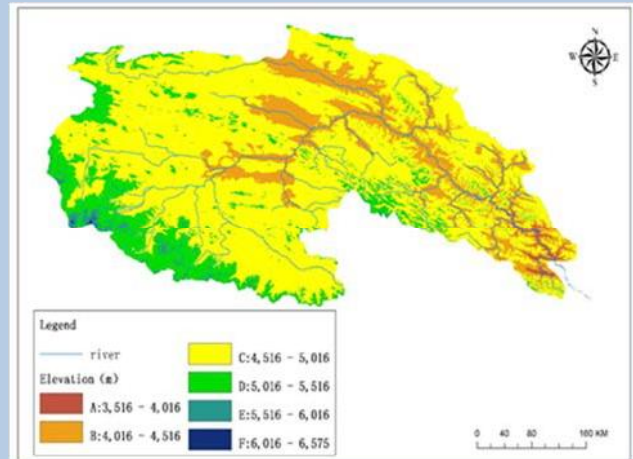


Fig.3: Elevation zone of study area

With GIS and RS techniques, the snow cover ratio of different altitudinal zones and their depletion curves of snow coverage (Fig. 4) were obtained in the headwater region of Yangtze River from MODIS snow production.

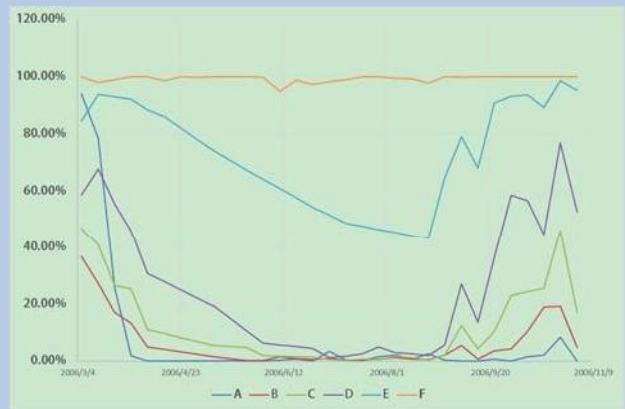


Fig4. Depletion curves of the snow coverage derived from Mod10A2 (2006 snowmelt season)

A Snowmelt Runoff Model (SRM) based on software WinSRM is established and calibrated.