



Towards an improved glacier monitoring program in the Kyrgyz Tien Shan and Pamir Mountains

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The monitoring of glacier mass balance in remote regions is important to understand the response of glaciers to climate change. The coverage of monitored glaciers in Central Asia has been very limited for the past 15 years; however the necessity of enhanced understanding regarding glacier dynamics and long term evolution in this particular region is crucial. Moisture availability importantly determines glacier response. Glaciers located in the Northern Tien Shan and Pamir Mountains are likely not to be directly influenced by monsoon such as most monitored Peri-Himalayan glaciers. However, not only scientific reasons make glacier monitoring to be of great relevance, also the link to political and socio-economic constraints on water scarcity carries high importance.

First steps towards the establishment of a new glacier monitoring network were performed in 2010/2011 and since then modernization and extension of the monitoring strategies are continuously aspired. Close cooperation of international and local scientists build the basis of the program. Today four glaciers located in the Kyrgyz Tien Shan (Golubin Glacier, Svek Zapadny Glacier, Glacier No. 354) and the North-Western Pamir (Abramov Glacier) are regularly monitored. The network is planned to be extended in the next years to cover selected glaciers in Uzbekistan and Tajikistan. Further, we intend to develop new approaches to remotely monitor sub-seasonal glacier mass balance at a regional scale.

In-situ mass balance measurements are taken at all four glaciers continuously in late summer. Automatic weather stations installed at Abramov Glacier in 2011 and at Golubin Glacier in 2013 deliver daily meteorological data allowing the application of a simple mass balance model driven with local precipitation and temperature data. Model calibration is performed using glaciological measurements and results are validated with snowline observations based on remote imagery. Automatic cameras at Abramov Glacier take several pictures daily all year-round since summer 2011. Similar cameras provide pictures at Golubin Glacier since summer 2013. Comparison with volumetric mass balance calculations are carried out and are planned to be intensified in the future. The combination of different monitoring techniques is expected to result in a sound approach to infer mass balance of the selected glaciers and should help to increase temporal as well as spatial resolution and accuracy of glacier mass changes on a regional level.

Here, we present first mass balance computations for the four Kyrgyz glaciers illustrating a general mass loss in recent years. Reanalysis and reconstruction of historical data for Abramov Glacier highlights the predominantly negative balances over the past 30 years. However, some inconsistencies are found in comparison to volumetric mass balance calculations for the same glacier for the period 2000-2011. Additionally, problems such as internal accumulation, possible regime changes but also technical problems due to the inaccessibility of the sites are challenging. Solutions are developed in close cooperation with local institutes with the clear aim to overhand main responsibility and lead to the local partners in the future in order to sustain the newly installed network on its high standards.