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# Changes in Djankuat Glacier budget and geometry since 1967/68

V. Popovnin
Cryolithology & Glaciology Dept., Geographical Faculty, Moscow Univ., Moscow, RUSSIA (begemotina@hotmail.com)

Judgements about the present glacier evolution pattern in the Caucasus are currently based mainly on a detailed and combined monitoring on the representative Djankuat Glacier. By 2011 its continuous series of annual mass balance values reached the total duration of 44 years, and the glacier was remapped in 1:10000 scale 7 times throughout this period. Combined glacio-hydro-meteorological observations and geodetic surveys, lasting several months, used to be annually carried out there. Djankuat became the most extensively studied Russian glacier now. Results of its long-term direct observations are presented with the principal goal to disclose the main tendencies in glacier evolution under the conditions of changing climate.

The prevalence of degradation trends over the whole time span since 1967/68 is evident though the period under direct instrumental measurements can be subdivided into stages. In the Caucasus the period of relative improvement of glacier state in the late 1980s – early 1990s was followed by restoration of the tendency towards stable mass loss that can be regarded as quasi-stationary on a decadal time scale. True, signs of gradual withdrawal from this state and a certain acceleration of degradation processes have appeared in recent years. Its cumulative mass balance during the instrumental monitoring period since 1967/68 approached -8000 mm of water equivalent, whereas its area diminished by 10 per cent. After the 2010/11 balance year the glacier mass reached its least value, established ever since the LIA climax.

Superposition of spatial patterns for external mass turnover (accumulation, ablation, mass balance) with those of internal turnover (ice motion) reveal the complicated process of alternation in ice flow velocity between the adjacent glacier branches. No strict cyclicity in acceleration of ice motion and hypsometrical surface rising can be discovered, but roughly periods, during which one of adjacent ice streams experiences dynamic and budget revival, last approximately 15 years.

Besides, drastic geomorphological alteration took place within the monitored period. Accelerated terminus retreat rate, sometimes >30 m/yr, caused pronounced changes in frontline configuration, ice cliffs and grottos were formed. Disjunction between the orographically left snout branch and its main nourishing reservoir in the lower cwm of the firn basin has terminated completely. This is fraught with a loss of a large glacier section owing to its transfer into the category of stagnant ice massif due to progressive debris melt-off out of the glacier body and its consequent piling up on the surface. The unique experience in repeated surveying of the debris thickness over the whole debris-covered part of the Djankuat Glacier – three times during the last 30 years – resulted in correspondent mapping. Progressive accumulation of lithogenic matter on the glacier surface reveals the impressive rate. Apart from the direct glacier response to climate changes, debris cover 3D-expansion is supposed to become one of the most active processes, which would determine in the nearest future both hydro-geomorphological evolution of glaciers in the Caucasus and intensification of natural glacial hazards.

Nevertheless, in spite of dominant tendencies, unfavourable for glaciation today, Caucasus remains nowadays among the leading three mountain systems of the Earth remarkable by the slowest ice mass loss rate.