THE ASSESSMENT OF SNOW ACCUMULATION, PRECIPITATION AND RUNOFF OVER THE KARAKORAM GLACIER SYSTEM FROM SATELLITE IMAGES

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The ablation over the glaciers could be calculated from the summer air temperature adjusted to the height of the snowline (Krenke 1982). By the definition of the snow line (more precisely - equilibrium line) the accumulation is equal to the ablation. The position of the snow line is possible to estimate from satellite images. The assessment of precipitation and runoff in the high alpine zone is carried out taking into account the accumulation on the glaciers, its relation to the solid precipitation, and runoff coefficient.

The glacier boundaries and their morphological types were estimated for the whole Karakoram on the satellite images made with cameras KFA-1,000 and KFA-200. The total surface of glaciers appears to be equal to 12,100 sq.km, their volume according to the typical thickness for each type is about 2,200 cubic kilometres, their water equivalent about 1,900 cubic kilometres. The altitude of the snow line on the glaciers was estimated using the analytical phototriangulation on overlapping images. The lowest (4,200masl) is the snow line on the glaciers on the southwestern slope of the Rakapochi massif, the highest (6,000masl) one is on the Central Rimo glacier. Along the western and southwestern slopes of the Karambar, Rakapochi, Kudjut, and Masnerbrom ranges, the snow line height decreases very rapidly to the southwest. The isokhyons are very close to each other. The snow line is relatively low along the valleys of Karambar, Hunza, Ind, and Shyok opened to the southwest. This permits us to conclude that the main amount of precipitation over Karakoram is generated by the Mediterrainian cyclones coming from the west. The

influence of monsoon precipitation is reflected in isokhyon features in the western Karakoram only, but even there they play a secondary role.

The calculation of accumulation was carried out by the superimposition of the map of summer air temperature and the map of the snow line on the glaciers. The accumulation decreases from 3,500mm in the region of the Rakapochi massif to less than 500mm in the vicinity of the Tibetan border. The comparison with the measurements of the Chinese expedition on the Batura Muztagh glacier (Hunza River basin) shows the error to be as small as 10%. The typical features of the accumulation map are the isoline loops, reflecting the interaction of air streams with the complex mountainous topography. The existence of such streams is distinguished by the vegetation distribution on the images, too.

The precipitation is estimated as accumulation divided by the coefficient of concentration. For the assessment of this coefficient, the morphological type of the glacier and relation of its surface to the surface of surrounding slopes were taken into account. On the precipitation map, one can see its decrease to the northeast from 2,000mm on the southern slopes of Karambar range to 200 - 300mm in Tibet.

The glacier runoff in milimetres is assumed to be equal to the ablation at the snowline at first approximation. The total amount is about 17 cubic kilometres and the average period of mass turnover is about 120 years. The glacier runoff into the Ind River (14 cubic kilometres) is almost five times more compared to the glacier runoff in the Jarkand River.

REFERENCE

Krenke, A.N., 1982. *Massoobmen v lednikovykh sistemakh SSSR (Mass-Exchange in the Glacier Systems of the USSR)* (In Russian). Hydrometeoizdat, Leningrad.