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Abstract

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In many parts of the world, water availability highly depends on snowmelt and glacier melt, which is formed in mountainous river basins. The snowmelt and snow cover dynamics are characterized by the seasonal snowline data that can be used to improve hydrological forecasts and for the climate changes related studies in mountain areas of Uzbekistan. However, snowline data based on traditional method are insufficient to represent large remote mountain areas with highly heterogeneous topography.

Nowadays, it is possible to obtain spatially distributed snow cover data for high-altitudes using the remote sensing methods. Thus, we used Moderate Resolution Imaging Spectroradiometer (MODIS) snow cover data in this study. The MODIS snow cover data was processed by the MODSNOW-Tool, which includes cloud elimination. With this, daily spatially distributed snow cover maps were prepared for the Pskem River Basin from 2000 to 2018. The daily cloud-free snow cover maps were used to assess daily snow elevation in the basin, which was used to study variation of snowline over the past 18 years.

The results showed that the analysis of trends in the dynamics of the monthly average minimum snowline shows that a statistically significant period of positive trends is especially in the spring season, as well as in the first month of summer and the negative trend was observed in the autumn season, respectively. The average temperature was positively correlated (R=0.88) with the monthly average minimum snowline, which was significant at the confidence level of 0.95. The correlation between the minimum snowline and the total precipitation was negative (R=-0.68) and not significant. The increasing trend (decrease of snowline) shows that snow in spring is increasing because winter precipitation is increasing or winter temperature is decreasing. More snow in winter means more snow fraction and lower snowline elevation in spring. The decreasing trend of snowline in autumn can be explained by increasing temperature in these months, which leads to decrease of precipitation falling as snow.

The main advantage of the daily minimum snowline information based on remote sensing data is to monitor remote mountain rivers. Using the remote sensing snow cover, understanding of hydrological processes in remote areas can be assured.