

Determination of Snow and Ice Melt Factors in the Himalayan Region through Field Investigations

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Abstract

Information on the degree-day factor for snow and ice is required for the estimation of snow and ice melt runoff from a glacierized basin. In the present study, degree-day factor for snow and ice are computed over Dokriani glacier at an altitude of about 4000m in the Garhwal Himalayas. Effect of natural dusting on both degree-day factors is also examined. For this purpose, natural dust available at the experiment site was uniformly spread over the surfaces of snow and ice blocks to form a 2 mm thick layer of it. The melt runoff from the snow and ice blocks along with air temperature at 2 m above the surface have been observed. Mean degree-day factor for clean and dusted snow blocks are computed to be 5.75 and 6.41 $\text{mm}^\circ\text{C}^{-1}\text{d}^{-1}$, respectively, whereas for clean ice and dusted ice the value of this factor was obtained to be 7.33 and 7.97 $\text{mm}^\circ\text{C}^{-1}\text{d}^{-1}$, respectively. Mean daily melt factors for dusted snow and dusted ice are always found higher than corresponding dust free snow and ice blocks. The average maximum hourly value of melt factor for the clean and dusted snow blocks were obtained to be 0.706 and 0.871 $\text{mm}^\circ\text{C}^{-1}\text{hr}^{-1}$, respectively, while minimum value was zero for all the cases. In the case of ice, the average maximum hourly ice melt factor was observed to be 0.919 and 1.057, respectively. Maximum hourly value of melt factor occurred at about 12 hours for both blocks. A comparison of degree-day factors for snow and ice is made with already available information in literature.