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Runoff delaying characteristics of the Gangotri Glacier, Central Himalayas

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Himalayas consist of several high mountain ranges where a number of glaciers exist in the high altitude area (>4000m). There are about more than 5000 glaciers in the Indian Himalayas comprising an area of about 38000 km^2. Depending upon the prevailing climatic conditions, the runoff contribution from the glaciers in the Himalayan Rivers starts in May after depletion of accumulated seasonal snow. Usually melt contribution from these glaciers continues till October. The melt water generated in the glacierized basin appears as runoff at the snout of glacier with a time-lag. Changes in delaying characteristics of the runoff over the melt season can be understood by studying the variations in time to peak (t_p) and time-lag (t_l) between melt generation and its emergence as runoff. In the present study, the runoff delaying characteristics of the Gangotri Glacier, the largest glacier in the Garhwal Himalayas (glacierized area 286 km^2; drainage area 556 km^2) have been studied. For this purpose, hourly discharge and temperature data were collected near the snout of the glacier (∼4000 m) for the entire ablation period (May–October, 2001). The diurnal variations in the hydrograph and temperature observed under clear weather days provided useful information for this study. In the early stages of the ablation period, poor drainage network and stronger storage characteristics of the glaciers due to the presence of seasonal snow cover resulted in a much delayed response of melt water, providing a higher t_l and t_p. A comparison of runoff delaying parameters with discharge ratio clearly indicated that changes in time-lag and time to peak are inversely correlated with variations in discharge.