

EFFECT OF SNOW AND ICE ON THE GARHWAL HIMALAYA ECOSYSTEM

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The Ganga River basin between $29^{\circ} 45'$ - $31^{\circ} 30'$ north latitudes and $78^{\circ} 2'$ - $80^{\circ} 7'$ east latitudes and having an area of $30,000 \text{ km}^2$, is called the Garhwal Himalaya. The Garhwal Himalaya contains more than 1020 large and small glaciers (Vohra 1981). The ecosystem has extreme variability in relief, precipitation, and radiant energy input. This is reflected in the diurnal, monthly, and seasonal variations in climate and hydrological responses. The basin has permanent ice cover, and also receives abundant winter snowfall from westerlies. The pattern and the quantity of runoff above Devaprayag both in the Bhagirathi and Alaknanda Rivers depend, therefore, on the extent of winter snowpack, incidence and form of precipitation, and thermal regime which determines the pattern of melting in spring and summer time.

Much of the water in the Himalayan region during the summer season is supplied by the melting of snow and ice. Snowmelt in the Himalayas is important. In the western Himalayas, 70 per cent of the annual discharge of the Indus and its tributaries are comprised of snowmelt (Tarrar 1982). This contribution of snowmelt to the annual discharge of streams and rivers in the Himalaya declines from west to east. However, meltwater from glaciers and winter snowpacks plays an important role in the conditioning of the hydrological response of rivers and streams which rise from high Himalyan catchments. Though studies of the snowcover and hydrology of glaciers in the Himalayan region date back to more than a century earlier, there has been remarkably little work done on the parameters mentioned above, in this region. As a consequence very little is known about this component of the hydrologic cycle compared to other processes in this environment which are even less understood.

The high degree of uncertainty about natural processes in the Himalayan environment has made the situation in these regions even more vulnerable. Since the past four decades, the Himalayan region has seen transformations at an unprecedented rate. Developmental activity in the face of inexorable population increase has brought about changes in this fragile ecosystem despite a poor understanding of the biogeographical processes. Development has opened up the accessibility of these formerly remote areas, and has led to ever increasing demands on the natural resources of this region. The economy of this region, which has individually been subsistence-based, is now being oriented towards a market economy.

Data on discharge and sediment transfer, collected on main glacierised basins in the Ganga headwaters in the Garhwal Himalaya since 1992, is presented.