

SNOW AND ICE MAPPING IN BHAGIRATHI BASIN UP TO LOHARINAG PALA USING REMOTE SENSING

Rathore D.S.

M. Arora,

R.D. Singh, G. Gupta

A. Dheeman

National Institute of Hydrology

Roorkee

ABSTRACT

The Himalayas constitute the largest reservoir of snow and ice outside the Polar Regions. The Himalayan Mountain, system is the source of one of the world's largest supplies of fresh water. All the major south Asian rivers originate in the Himalayan and their upper catchments are covered with snow and glaciers. In view of this, study of the extent of the Himalayan snow and glacier cover is important. Since the Himalayan region presents difficult and inaccessible terrain, use of remote sensing technique is important in the scientific studies in this area.

Several snow and glacier morphological features might exist in the area in melting season. These are moraine and debris covered glaciers, exposed glaciers, wet snow, percolation and dry snow. Himalayan glaciers are mostly moraine and debris covered. Several of these features have different spectral characteristics and these can be discriminated in the satellite data.

Several digital image processing techniques have been in use for discriminating the snow and glacier features. These are supervised and unsupervised classifications, rule based on NDSI and individual band digital numbers (DN)/reflectances etc. In this study, latter technique is used to discriminate exposed ice, wet and dry snow in the Bhagirathi basin up to Loharinag Pala. The melt-water stream emerging from the snout of the Gangotri Glacier at an elevation of 4000 m is known as river Bhagirathi. The catchment area is 4555 sq. km and lies between latitudes 30° 30' N and 31° 30' N and longitude between 78° 30' E and 79° 30' E. Elevation varies between 2153 m and more than 6904 m

Rule based technique was used to delineate snow covered area in IRS LISS- III data for 8 July 2002, 7 September 2004 and 9 August 10 2005. A composite snow covered map was prepared from snow cover on individual dates. Rule based was used on July 2002 data for delineation of wet snow, dry snow and ice. The technique utilized NDSI, individual bands DN. Misclassification of snow in the shadow area in to wet snow or ice was corrected using SRTM (Version 4) digital elevation model (DEM). Composite snow cover map was used to delineate snow underneath clouds. Area under moraine covered glacier, ice, wet snow and dry snow was 233, 101, 228 and 279 sq km respectively. Accumulation area ratio was 0.60. The information can be utilized in characterization of the basin for studying effect of climate changes, hydrological modeling etc.