

Measuring Changes in Glacier extent of Dhauliganga basin, Kumaun Himalaya using Remote sensing and GIS techniques

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Abstract: Himalayan glaciers are considered as the third pole environment of the Earth and the water tower of Asia. In general glaciers all around the world are receding, but Himalayan glaciers are receding much faster as compared to glaciers in other parts of the globe. Himalayan glaciers are Alpine and mountain type glaciers that present complexity in the different climatic conditions. These glaciers are very tough to monitor by field. Remote sensing method present a comprehensive approach for glacier monitoring in harsh and remote areas.

Present study is based on the change in surface area of the glaciers in downstream region of Dhauliganga basin, Pithoragarh district, Uttarakhand. For this, SOI toposheet No. 62 B/8 & B/12, surveyed in 1963 have been used as primary data for glacier outlines. 12 glaciers are selected for the study from the toposheet. RGI (Randolph Glacier Inventory) data version 60. (15_RGI 60.SouthAsiaEast) released July 28 2017 for recent change. RGI glacier outlines are used to supplement the GLIMS database. Landsat 8 OLI/TIRS image pertaining to date 06 November 2016 was downloaded from USGS. The end of ablation period is used for measuring current fluctuation in glaciated area from SOI toposheet (1963) to 2016. ASTER GDEM was used for automatic extraction of basin boundary by hydro-processing methods. Glacier boundaries were manually digitised from both the toposheet and Landsat image for better accuracy. However manual digitization is more time consuming method than automation. The total glaciated area by GLIMS (1999-2001) outlines from selected glaciers is 49.71 km² of total basin area (1365.21 km²). The calculated area is 49.71 km² and 40.72 km² as determined from the RGI and the Landsat image of 2016 respectively. Total vacated area by the retreat of glacier from 1999-2001 to 2016 is 8.99 km², which accounts to a total loss of 18.08 % from the total glaciated area. Google Earth imagery was also considered for marking the actual position of glacier outlines.

Keywords: GLIMS, ASTER, Landsat, Glacier Area Change, Google Earth.