

High Altitude Glacier Surface Mapping in Dhauliganga Basin of Himalayan Environment Using Remote Sensing Technique

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Abstract : Glaciers play an important role in climate change and are sensitive phenomena of global climate change scenario. Glaciers in Himalayas are unique as they are predominantly valley type and are located in tropical, high altitude regions. These glaciers are often covered with debris which greatly affects ablation rate of glaciers and work as a sensitive indicator of glacier health. The aim of this study is to map high altitude Glacier surface with a focus on glacial lake and debris estimation using different techniques in Nagling glacier of dhauliganga basin in Himalayan region. Different Image Classification techniques i.e. thresholding on different band ratios and supervised classification using maximum likelihood classifier (MLC) have been used on high resolution sentinel 2A level 1c satellite imagery of 14 October 2017. Here Near Infrared (NIR)/Shortwave Infrared (SWIR) ratio image was used to extract the glaciated classes (Snow, Ice, Ice Mixed Debris) from other non-glaciated terrain classes. SWIR/BLUE Ratio Image was used to map valley rock and Debris while Green/NIR ratio image was found most suitable for mapping Glacial Lake. Accuracy assessment was performed using high resolution (3 meters) Planetscope Imagery using 60 stratified random points. The overall accuracy of MLC was 85 % while the accuracy of Band Ratios was 96.66 %. According to Band Ratio technique total areal extent of glaciated classes (Snow, Ice ,IMD) in Nagling glacier was 10.70 km² nearly 38.07% of study area comprising of 30.87 % Snow covered area, 3.93% Ice and 3.27 % IMD covered area. Non-glaciated classes (vegetation, glacial lake, debris and valley rock) covered 61.93 % of the total area out of which valley rock is dominant with 33.83% coverage followed by debris covering 27.7 % of the area in nagling glacier. Glacial lake and Debris were accurately mapped using Band ratio technique Hence, Band Ratio approach appears to be useful for the mapping of debris covered glacier in Himalayan Region.

Keywords : band ratio, Dhauliganga basin, glacier mapping, Himalayan region, maximum likelihood classifier (MLC), Sentinel-2 satellite image

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