

SUPRAGLACIAL DEBRIS COVER MAPPING IN BASPA BASIN, WESTERN HIMALAYA

The Himalayan glaciers are valley glaciers, surrounded by steep rock walls. Weathering and erosion of these walls supply debris, which are transported down the glacier slope and are known as Supraglacial Debris Cover (SDC). This has profound influence on the glacier dynamics, since it alters the surface energy balance by insulating the glacier ice and hence influences the glacier melt, depending upon the thickness of debris. Generally, heavily debris-covered glaciers experience stable terminus and mass loss close to the Equilibrium Line Altitude. This eventually results in the reduction of glacier slope and leads

to the formation of supraglacial lakes. The debris covered glaciers with lakes lose more mass than clean glaciers. Therefore, a better understanding of SDC is necessary to predict future changes in glaciers. As monitoring of the SDC change in the field is challenging, there is a need to develop simple models for SDC.

We have developed a new method to modify the existing glacier boundary using satellite data. As seasonal snow cover on SDC causes hindrance in accurately quantifying SDC changes, it was removed using a maximum

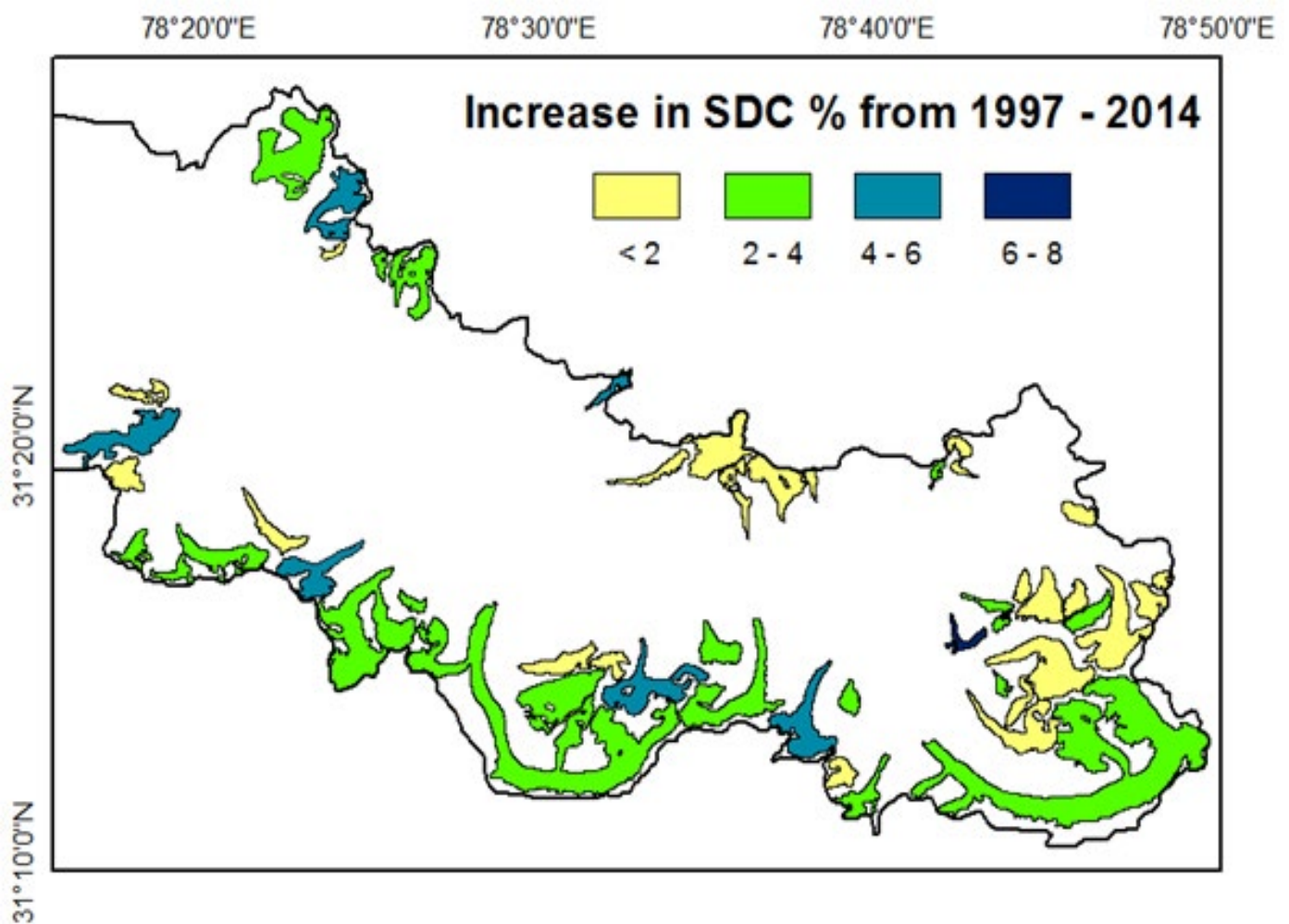


Figure 1: The figure shows increase in Supraglacial debris cover (SDC) for glaciers in Baspa basin.

likelihood based classification technique. Then, the changes in SDC was mapped using Normalized Difference Snow Index (NDSI).

The study was conducted on a glaciated region with an area of around 60 square kilometers. We found that SDC has steadily increased from 1997 to 2014 by around 2.8%. Naradu, a benchmark glacier in the basin, is one of the glaciers with highest increase in SDC by 5.6%. The reason for the high increase could be the prolonged negative mass balance.

Further, three of the glaciers in the basin have 60 to 85 % of SDC and if this trend continues, they have the potential to turn into rock glaciers. These rock glaciers can eventually develop into lakes. This can influence water supply for drinking, irrigation and hydro power generation.

Reference: S. Pratibha and A. V. Kulkarni, Decadal change in supraglacial debris cover in Baspa basin, Western Himalaya. Special Section: Himalayan Cryology. Current Science, 114, 792-799, 2018.



Figure 2: Field photograph of Supraglacial debris cover at Naradu glacier, Baspa basin. Glacier terminus is completely covered by debris and higher altitude regions are debris free.