Submitted Abstract

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Title	The Relation Between Heterogeneous Glacier Mass Balance To Various Morphological Parameters In The Indian Central Himalayan Region.
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Abstract

Understanding current and future glacier mass change are crucial to avoiding water-scarcity-induced socio-political instability. The glacier response which can be calculated by measuring area changes, length changes, thickness changes, or mass balance is not equal at the catchment scale. It can be explained by a complex interplay of many morphological factors, which is very important to understanding the future of an individual glacier. Therefore, the satellite-based geodetic mass balance has been calculated in the Central Himalayan region to know the current status of the glaciers in this region and understand which morphological parameters are responsible for their heterogeneous mass balance. The "best subset method" has been used to identify the confining parameters from the list of probable parameters reported in the previous studies. After that, multiple linear regression was introduced to understand the relation between the selected parameters and the mass balance. The result of the mass balance shows that the average mass balance is -0.799±0.209 m.w.e.y-1 in the studied sample glaciers. Also, the 95% confidence interval shows that the range of mass loss lies between -0.507 to -1.08 m.w.e.y-1 in the entire Garhwal Himalayan region. The result also indicates that the larger mass balance ranges are due to variations in the mean slope and percentage of debris cover in the glaciers. In detail, the debris cover has a positive coefficient, meaning that the mass balance is negative, however, this negative effect decreases with an increase in the debris cover and vice versa. On the other hand, mass balance is inversely proportional to the mean slope of the glacier. That means mass balance is more negative when the slope is steep, and less negative or positive mass balance can be seen over gentler slopes. We also observed an approximate mass gain of 0.36 m.w.e.y-1 with the rise of 10% debris cover for a given slope. Additionally, an interesting phenomena was noticed that as the steepness of the slope surges by 10%, the mass loses by 0.86 m.w.e.y-1 for debris cover glacier.