

Formation conditions of supraglacial lakes on debris-covered glaciers in the Himalayas

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The Himalayas contain many debris-covered glaciers, some of which have large glacial lakes at the terminus. These lakes have been growing in size since the 1950s and 1960s, giving rise to the potential hazard of glacial-lake outburst floods. Reynolds (2000) reported that in the Bhutan Himalayas, glacial lakes form in those parts of the glacier where the inclination of the glacier surface is < 2 degrees. There are some glaciers with the inclination is < 2degrees, although they have no glacial lake.

In the present study, we identify the formation conditions of glacial lakes by analysing two easily measurable topographic parameters: inclination of the glacier surface and the difference in height between the glacier surface and lateral moraine ridges (herein, this difference is referred to as DGM, which is an indicator of glacier surface lowering on debris-covered glaciers).

The result indicated that for all glaciers with large supraglacial lakes, values of DGM exceed 60 m and the average inclination of the glacier surface is less than 2.0 degrees. In summary, we clarified that the formation conditions of a glacial lake can be clearly expressed in terms of the inclination of the glacier surface and the amount of lowering of the glacier surface since the LIA in the Himalayas.

Keywords: glacial lake, glacial-lake outburst floods, glacier dynamics