

Himalayan lakes are exacerbating glacial melt

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Figure 1: A typical situation in the Himalaya: glaciers have largely retreated, and lakes now cover the area where the glacier tongue was in earlier times – Garlung Co lake in Central Himalaya. Photo taken by J Pronk in October this year during a joint expedition with Chinese colleagues from the Institute of Tibetan Plateau Research. Credit: University of St Andrews

The rate glaciers are melting in the Himalaya is being significantly accelerated by lakes already formed by glacial retreat, new research led by the University of St Andrews has found.

The study, published in *Scientific Reports*, concluded that the [glaciers](#) which have flowed into the lakes in recent decades are retreating and thinning at a much greater rate than any other glaciers in the Himalaya.

These glaciers are responsible for as much as 30 percent of the ice loss in different parts of the mountain range, despite comprising just 10 to 15 percent of the total glacier population.

The behavior of glaciers provides the clearest indication of climatic change in high mountain regions. Long-term atmospheric warming has caused the recession of glaciers across the Himalaya.

Meltwater from glaciers in this region sustains the flow of river systems on which hundreds of millions of people depend for their basic needs.

Not all the meltwater instantly drains to downstream catchments and thousands of [glacial lakes](#) have developed and continue to expand high in the Himalaya. Until this study, the influence of glacial lakes on glacier behavior has not been thoroughly investigated in the Himalaya, despite the rapid increase in [lake](#) area and number.



Figure 2: A large lake formed where once a glacier was: Lake Garlung Co.
Credit: T Bolch, University of St Andrews



Figure 3: Where lakes formed, glaciers retreated significantly: Lake Garlung Co, Central Himalaya. Credit: J Pronk

Now, scientists have used declassified US Hexagon spy satellite imagery, data from the Shuttle Radar Topographic Mission in 2000 and data from modern satellites to examine the relationship between glaciers and glacial lakes since the 1970s.

The results show that glacier mass loss has occurred since at least the 1970s and has accelerated since the millennium. Glaciers in contact with glacial lakes, showed significantly higher mass loss and terminus retreat rates and are therefore likely to be driving the accelerating mass loss from the region.

Dr. Owen King, of the School of Geography and Sustainable Development at the University of St Andrews, said: "Further enhanced mass loss is very likely should the increases in the total number and area of glacial lakes continue."



Figure 4: Lake Jialong Co in Central Hiamalya. Credit: T Bolch, University of St Andrews

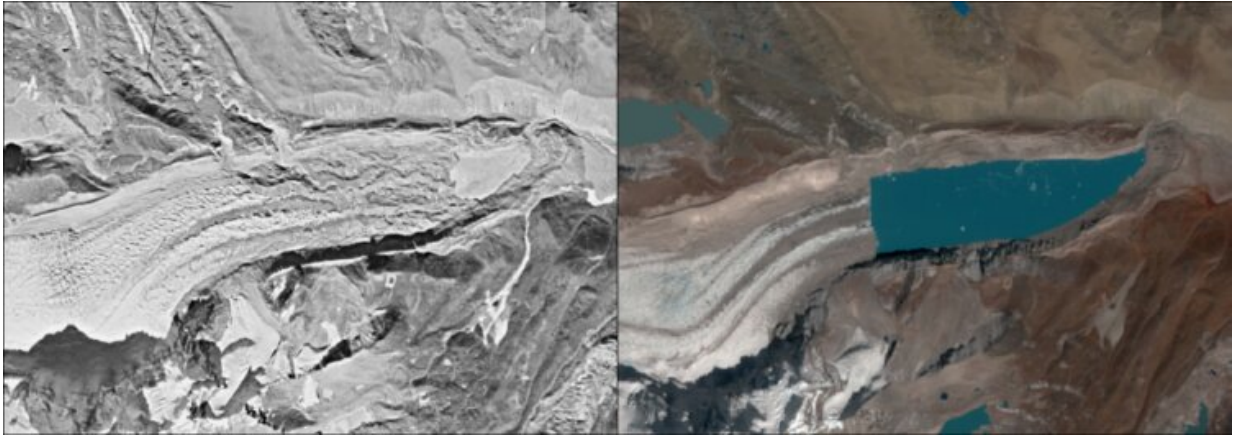


Figure 5: Significant retreat of a glacier and growth of its proglacial lake in Sikkim Himalaya: comparison of the situation years 1974 based on Hexagon KH-9 US spy satellite data and 2017 Pleiades satellite data. Credit: University of St Andrews

Dr. Tobias Bolch, also of the School of Geography and Sustainable Development, added: "Our results have important implications for future projections of ice loss from the region, as the interaction of glaciers and glacial lakes has not previously been considered in future glacier [ice loss](#) estimates."

The paper, "Glacial lakes exacerbate Himalayan glacier [mass loss](#)," by Owen King, Atanu Bhattacharya and Tobias Bolch, is published in *Scientific Reports*.

More information: Owen King et al. Glacial lakes exacerbate Himalayan glacier mass loss, *Scientific Reports* (2019). [DOI: 10.1038/s41598-019-53733-x](https://doi.org/10.1038/s41598-019-53733-x)

Provided by University of St Andrews

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