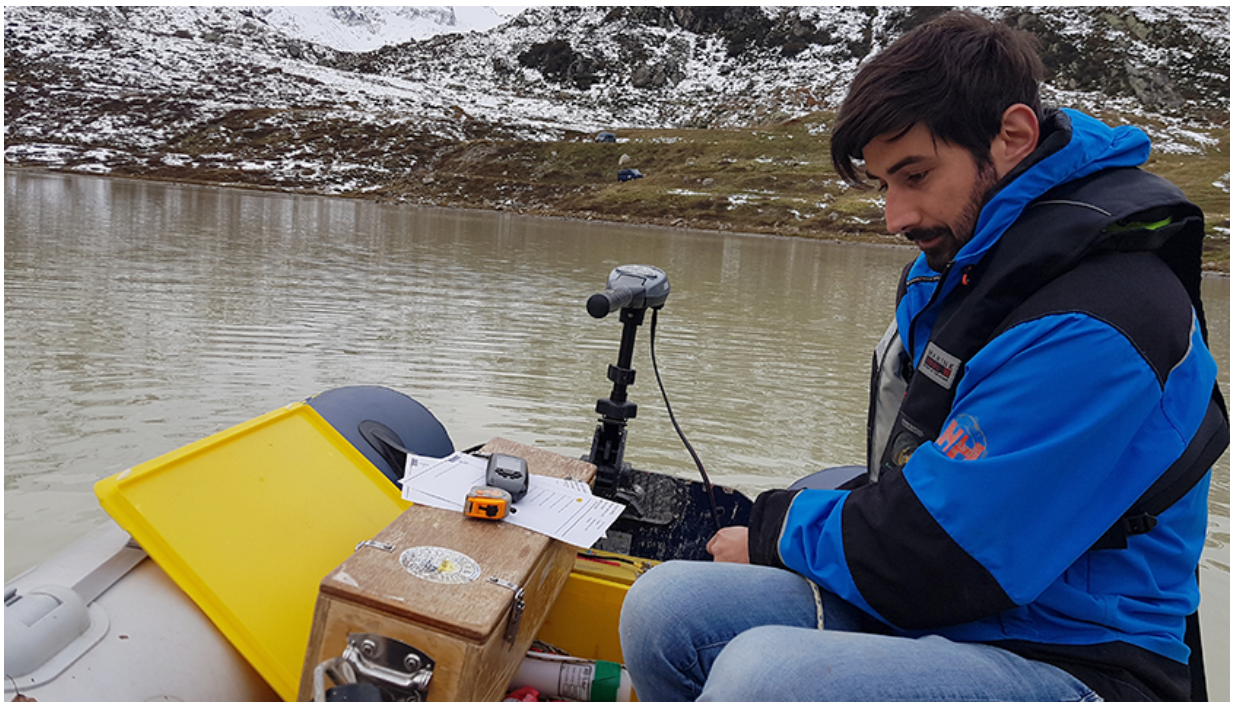


1,200 new glacial lakes discovered

July 19, 2021 | Bärbel Zierl
Topics: Climate Change & Energy | Ecosystems

A comprehensive inventory of Swiss glacial lakes shows how the lake landscape in the high mountains has changed since the end of the Little Ice Age.

Due to climate change, the glaciers of the Alps are melting. When the sometimes huge ice fields retreat, they often leave behind depressions and natural dams in the exposed landscape. The basins can fill with meltwater and new glacial lakes are formed. Since the end of the Little Ice Age around 1850, almost 1,200 new lakes have been added in formerly glaciated regions in the Swiss Alps. Around 1,000 still exist today. This is shown by a new, comprehensive inventory of all Swiss glacial lakes.

“On the one hand, we were surprised by the sheer numbers and on the other by the marked acceleration in formation,” says Daniel Odermatt, Head of the Remote Sensing Group at the aquatic research institute Eawag. “At the beginning of the project, we expected a few hundred glacial lakes. Now there are over a thousand, and 180 have been added in the last decade alone.” In the team with his postdoc Nico Mölg, together with researchers from the University of Zurich and the Federal Office for the Environment, they have surveyed all the glacial lakes that have formed in the Swiss Alps over the past 170 years or so and recorded various indicators.

Dates go back to the end of the Little Ice Age

The comprehensive inventory was only possible thanks to the high-quality aerial photo data from Swisstopo and many years of data on glaciers in Switzerland. The oldest information dates back to the middle of the 19th century. “When the ice began to melt at the end of the Little Ice Age, it caught the interest of the naturalists at the time,” Mölg explains. “Between 1840 and 1870, the change in extent and length of some large glaciers in the Swiss Alps were therefore mapped for the first time for the Dufour map.” With the “American Aerial Survey” of 1946, the first high-quality aerial photographs

became available. In total, the research team was able to draw on data at seven points in time between 1850 and 2016.

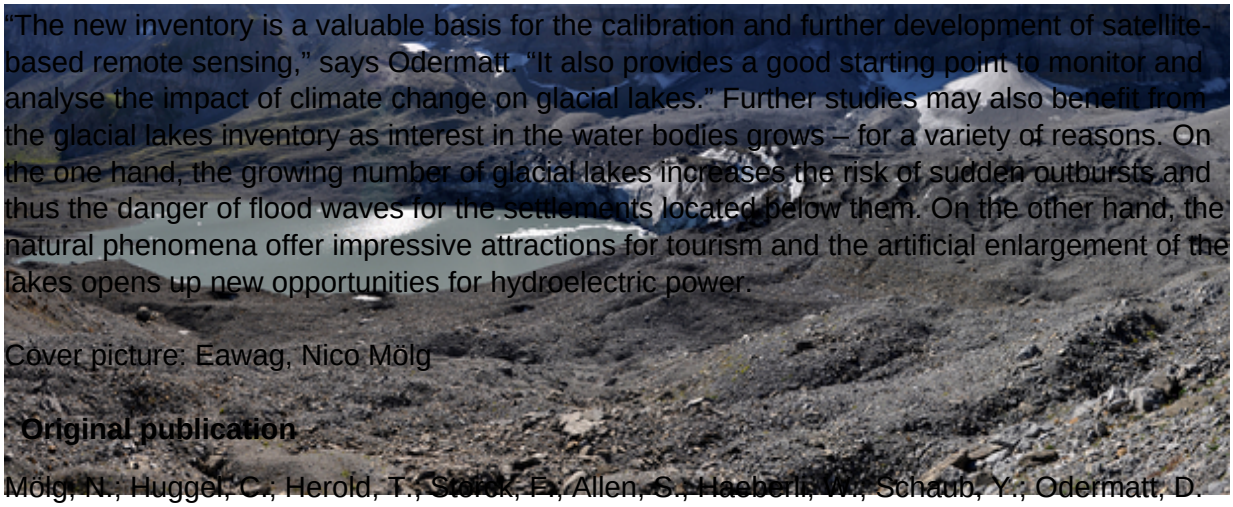
For each of the 1,200 lakes, the researchers recorded the location, elevation, shape and area of the lake at the different times. They determined the type and material of the dam, surface drainage and recorded the development of the lake. With this basic information, the next step is to estimate the individual hazard potential of the lakes, such as the risk of the sudden emptying of the lake in the event of a dam failure.

Glacial lakes as evidence of climate change

All results are now available in the glacial lakes inventory. Some interesting facts: In 2016, Swiss glacial lakes covered an area of about 620 hectares. The largest lake measured 40 hectares, but over 90 percent were smaller than one hectare. Glacial lake formation reached an initial peak between 1946 and 1973, with an average of almost eight new lakes per year. After that, there was some respite. But between 2006 and 2016, the rate at which new glacial lakes formed increased again significantly and clearly exceeded the previous maximum. On average, 18 new lakes appeared each year and the water surface increased by more than 150'000 square metres annually – visible evidence of climate change in the Alps.

However, about a quarter of the new lakes have also shrunk or even disappeared altogether. The sediments, continuously transported by the glacier, slowly refilled the lakes. For example, the lake at the Huefifirn glacier in the canton of Uri lost about 20 percent of its surface area between 1985 and 2016. 187 glacial lakes even disappeared completely in the last 170 years or at least shrank to less than 200 square metres. “However, some lakes have also broken out/or have been artificially drained,” says Mölg. “These processes are also evident in our records.”

Opportunities and risks of the new glacial lakes



“The new inventory is a valuable basis for the calibration and further development of satellite-based remote sensing,” says Odermatt. “It also provides a good starting point to monitor and analyse the impact of climate change on glacial lakes.” Further studies may also benefit from the glacial lakes inventory as interest in the water bodies grows – for a variety of reasons. On the one hand, the growing number of glacial lakes increases the risk of sudden outbursts and thus the danger of flood waves for the settlements located below them. On the other hand, the natural phenomena offer impressive attractions for tourism and the artificial enlargement of the lakes opens up new opportunities for hydroelectric power.

Cover picture: Eawag, Nico Mölg

Original publication

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Related Links

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Mission Gletscherrettung

Aerial photographs from 1946 ("US flight mission") now published on map.geo.admin.ch

Background information on the Dufour Map

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