

New methods make use of old photographs and allows quantitative analyses of glacier changes

Per Holmlund (1) and Erik Holmlund ()

(1) (per.holmlund@natgeo.su.se), (2) erik-holmlund@hotmail.com

In 2012-2016 we have digitalized a large number of old photographs taken 1861-1980 on glaciers in Sweden and on Svalbard. Many of these photos were taken from cairns easily found today. In order to make use of these old data for quantitative analyses our project aimed at constructing digital terrain models and geo reference the old photos in a 3D coordinate system. In a pilot study conducted in August and September 2016 we made digital terrain models of four Swedish glaciers and four on Svalbard, by using a drone to construct ortophotos. By identifying control points in the model we could reconstruct past shapes of the glaciers based on old photos. And by analyzing the fore field landforms we could retrieve information on past thermal structures of the glaciers and whether or not it is a surging glacier. This opens up new perspectives in analyzing glacier responses to climate change. In Sweden we have 25-30 glaciers under semi-annual front position observation. 18 of them compose the Swedish contribution to the World Glacier Monitoring Service. Differences in response to local climate effects have been difficult to analyze on many of these sites, as data on volume changes and thermal structure of the ice is sparse or lacking. Over the last eight years we have sampled data on the thermal structure of one third of the total number of Swedish glaciers and a significant part of the mountain range was laser scanned in 2015 by the Swedish Authority of Land Survey, allowing production of digital terrain models of the present state. The objectives of this project are: To improve and expand glacier monitoring by introducing new methods, to map and add new knowledge to our understanding of the dynamic response of glaciers and to make quantitative analyses of old photographs on glacier change. Our hypothesis is that new useful conclusions can be drawn out of old data, by using new techniques.