

Predicting future glacial lakes in Austria using different modelling approaches

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Glacier retreat is one of the most apparent consequences of temperature rise in the 20th and 21st centuries in the European Alps. In Austria, more than 240 new lakes have formed in glacier forefields since the Little Ice Age. A similar signal is reported from many mountain areas worldwide. Glacial lakes can constitute important environmental and socio-economic impacts on high mountain systems including water resource management, sediment delivery, natural hazards, energy production and tourism. Their development significantly modifies the landscape configuration and visual appearance of high mountain areas. Knowledge on the location, number and extent of these future lakes can be used to assess potential impacts on high mountain geo-ecosystems and upland-lowland interactions. Information on new lakes is critical to appraise emerging threats and potentials for society.

The recent development of regional ice thickness models and their combination with high resolution glacier surface data allows predicting the topography below current glaciers by subtracting ice thickness from glacier surface. Analyzing these modelled glacier bed surfaces reveals overdeepenings that represent potential locations for future lakes.

In order to predict the location of future glacial lakes below recent glaciers in the Austrian Alps we apply different ice thickness models using high resolution terrain data and glacier outlines. The results are compared and validated with ice thickness data from geophysical surveys. Additionally, we run the models on three different glacier extents provided by the Austrian Glacier Inventories from 1969, 1998 and 2006. Results of this historical glacier extent modelling are compared to existing glacier lakes and discussed focusing on geomorphological impacts on lake evolution.

We discuss model performance and observed differences in the results in order to assess the approach for a realistic prediction of future lake locations. The presentation delivers intermediate results from the FUTURELAKES project, which aims at generating the first nation-wide data set on future glacial lakes in Austria.