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The new Austrian glacier inventory: a tool for the analysis of modern glacier change

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"Changes in mountain glaciers are among the best indicators of climate change. Glaciers in the European Alps are comparably small and their melt will not contribute significantly to global sea level rise. However, they are sensitive indicators of climate change over a few decades and their disappearance might have severe economic and social impacts, for example on the hydrological regime, natural hazards and tourism. In particular as the Alps are the most densely populated high mountain region in the world" (Paul et al., 2004).

In Austria, the first complete glacier inventory (Patzelt, 1980) was compiled from aerial photography taken in 1969. This inventory contains the original aerial photographs, glacier maps (including elevation contour lines, spot heights, glacier boundaries, snowlines and moraines) in the scale of 1:10000, the distribution of glaciated area in different elevation zones and information about former glacier stands. In 1969, 918 glaciers existed in Austria, which covered a total area of 540 ± 10 km^2 (Patzelt, 1980).

Since then, significant changes in ice covered areas have taken place in the Alps, with a pronounced advance period of most mountain glaciers until about 1982 (Patzelt, 1987) and a strong retreat afterwards (Paul et al., 2002). In order to update the existing inventory, document the occurred changes and investigate the climate related glacier reaction, a new digital glacier inventory of Austria based on aerial photographic surveys from 1996 to 1999, is in process (Würländer and Kuhn, 2000). Results from a detailed analysis of these data (Würländer and Eder, 1998) are integrated into the new, fully digital glacier inventory: digital elevation models (DEM), glacier objects and digital orthoimages. The required investigations for establishing the inventory have been carried out using modern GIS technology.

The new inventory provides the necessary basis for a detailed analysis of glacier changes over the last 30 years in the Austrian Alps and is readily interconnected with the required GIS tools. Changes in volume and extent can now easily be investigated in dependence of elevation, exposition, climatic conditions and other parameters.