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Glaciers in Austria - past and present

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The glaciers in the Austrian Alps, their changes and their relationship to climate change are investigated. There are about 900 glaciers, covering less than 450 km^2 in elevations between 2100 m and 3800 m in Austria. Two complete glacier inventories from 1969 and 1998 are used to present the glacier distribution and glacier changes at the end of the last century. We found a quantifiable relationship between glacier size, elevation and mean climatic values. Glacier changes between 1969 and 1998 were in total negative interrupted by an advance in the late 1970s and early 1980s. In the past decade, glacier retreat accelerated. Airborne Laser Scanning (ALS, LIDAR) proves to be an ideal tool to monitor glacier area and volume changes accurately. For the Ötztal Alps, glacier recession between 1998 and a new LIDAR-derived inventory of 2006 is quantified: Area reduced by 8.2%, volume by 1.0 km^3 and mean thickness by 8.2 m. The three glacier inventories provide the basis to compare rates of glacier recession for the two periods investigated. Rates of volume changes have increased more than rates of area changes; rates of changes of large glaciers have increased more in recent years, than rates of changes of small glaciers did. There is evidence for a North-to-South-gradient of magnitudes of glacier changes: Stronger recession is observed in the Southern part. A model is applied to reconstruct annual balances for a large sample of glaciers in Austria (96% of total glacier covered area). The course of the annual balances is reproduced well by the model; a temporally adjusted set of tuning parameters improves the performance of the model, possible reasons for that are discussed.