Geophysical Research Abstracts
Vol. 14, EGU2012-11605, 2012
EGU General Assembly 2012

Internal melt as an important contributor to the total mass balance of Alpine glaciers

A. Haberkorn (1,2), A. Fischer (1,3), R. Sailer (4,5)

(1) Institute of Meteorology and Geophysics, University of Innsbruck, Innsbruck, Austria, (2) now at: WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland (haberkorn@slf.ch), (3) Institute of Mountain Reasearch: Man and Environment, Austrian Academy of Science, Innsbruck, Austria, (4) Institute of Geography, University of Innsbruck, Innsbruck, Austria, (5) AlpS - Centre for Climate Change Adaptation Technologies, Innsbruck, Austria

The total glacier mass balance is composed of the surface-, the internal- and the basal mass balance. Traditionally, the internal- and the basal mass change of a glacier are assumed to be negligible. During recent years, areas with exceptional high subsidence rates compared to their surroundings have been observed on several Alpine mountain glaciers which lead to the assumption that internal- or basal melt processes must play an important role at such locations. Detailed measurement campaigns were carried out at the tongue of Hintereisferner, Ötztal Alps, Austria, in 2009 and 2010, in order to assess the contribution of such processes to the local mass balance.

We applied a multi–method approach, which includes direct surface mass balance measurements, digital elevation models (DEM) generated during four detailed differential GPS field surveys, ground penetrating radar (GPR) ice thickness measurements, a simple model of local ice dynamics, as well as a comparison of DEM gained by airborne laser scanning (ALS).

The total mass change was derived by DGPS measurements and amounts to $-475 \cdot 10^6$ kg. The surface mass change, obtained by the direct glaciological method is just $-431 \cdot 10^6$ kg and the dynamical mass change due to the ice fluxes across the test site margins is $42 \cdot 10^6$ kg. Therefore, a substantial amount of ice must be removed by internal- or basal melt processes.

Using the above mentioned values, the contribution of basal or internal melt is quantified with a value of $-87 \cdot 10^6$ kg, which is a relative contribution to the total mass balance of 18%. This indicates that subglacial melt processes play a significant role at the study site.