

Annual mass balance estimates for Haut Glacier d'Arolla from 2000–2005 using a distributed mass balance model and DEM's.

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In order to assess the impact of future climate scenarios on water availability in glaciated basins, we are implementing a combined field observation and distributed modeling approach. Accurate estimation of water stored within the snow and ice cover of these basins requires knowledge of the distributed snow and ice mass balance throughout the year.

In this study, we are estimating the annual mass balance and runoff for Haut Glacier d'Arolla from 2000–2005. Haut Glacier d'Arolla is a small, temperate valley glacier in southwestern Switzerland. Our estimations are based on an energy balance model driven by meteorological variables from three automatic weather stations within the catchment. The model results are validated with direct mass balance measurements and observed elevation changes from two digital elevation models (DEM's), derived from aerial photographs in September 1999 and 2005.

From combined mass balance measurements, energy balance calculations and recorded hydrometeorological variables, we are estimating the contribution from icemelt to the runoff for this period to be around 25%, the contribution from snow around 60% and the contribution from rain 15%. It is therefore important for water resources management to understand the distribution of snow in an alpine catchment, as it seems to be the controlling factor for the shape of the hydrograph, and therefore the availability of water throughout the season.