



## **Snowpack evolution on the Indren glacier (NW Alps, Italy) under different meteorological conditions.**

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Snow metamorphism in the snowpack is driven by different factors, temperature gradient and snow density being the most important. The basal temperature, together with the snow depth, determines the temperature gradient. This study aims to analyse the evolution of the snowpack on a glacier under different meteorological conditions, paying particular attention to the relationship between snow depth and temperature at the snow/ice interface. The chosen study site is the Indren glacier (3000 – 4100 m a.s.l.) in the North-western Alps in the Aosta Valley (Italy), where snowpack evolution was studied for winter 2002-2003, which was rich of snow from the beginning of the season, and for winter 2005-2006, which by contrast had little snow until February. Periodical snow profiles were dug to analyse the snowpack structure (e.g. snow crystal type and dimension, snow density) and to measure the snow temperature, while the basal temperature was continuously measured by a data-logger placed at the snow/ice interface. Moreover, in winter 2002-2003, the influence on the snowpack evolution of an artificial increase in the snow density was evaluated. From these two winter seasons, results show that a deep snowcover is able to maintain a temperature at the snow/ice interface of around  $-5^{\circ}\text{C}$  until the snowcover reaches isothermal conditions in Spring, whereas, during winter 2005-2006, the small amounts of snow did not allow basal temperature to reach an equilibrium value, which thus fluctuated as a function of air temperature and snow depth. In the winter 2002-2003, faceted crystals were only found in a snow-profile dug the end of March below a superficial crust of corn snow. By contrast in winter 2005-2006, faceted crystals were the principal form found in snow-profiles, as kinetic metamorphism was present due to the shallow snowpack and low air temperatures. The different meteorological conditions affected the evolution of the snowpack and, in particular, increased snow densities caused a delay in the time to reach isothermal conditions, thus allowing snowcover on the glacier to persist longer.