

Name of research institute or organization:

Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie (VAW)

Title of project:

Determination of englacial temperature in Gornergletscher

Project leader and team:

Dr. Martin Lüthi
Claudia Ryser

Project description:

The thermal structure of Gornergletscher was investigated with a helicopter-borne 30 MHz ice radar and in-situ temperature measurements in 15 boreholes through the glacier.

Cold ice is advected from the high-elevation accumulation zone (Colle Gnifetti 4500 m a.s.l.) and reaches the glacier tongue. There it occupies a flowband of 400 m width and reaches depths up to $\frac{3}{4}$ of the total ice thickness.

Cold ice within a polythermal ice body controls its flow dynamics through the temperature dependence of the ice viscosity, and affects glacier hydrology by blocking water flow paths. Lakes at the surface, linked by persistent, deeply incised melt-water streams, are hallmark features of cold ice in the ablation zone of Gornergletscher.

In the following figure (Figure 1), the extent of cold ice on the tongue of Gornergletscher is marked with the blue hatched area.

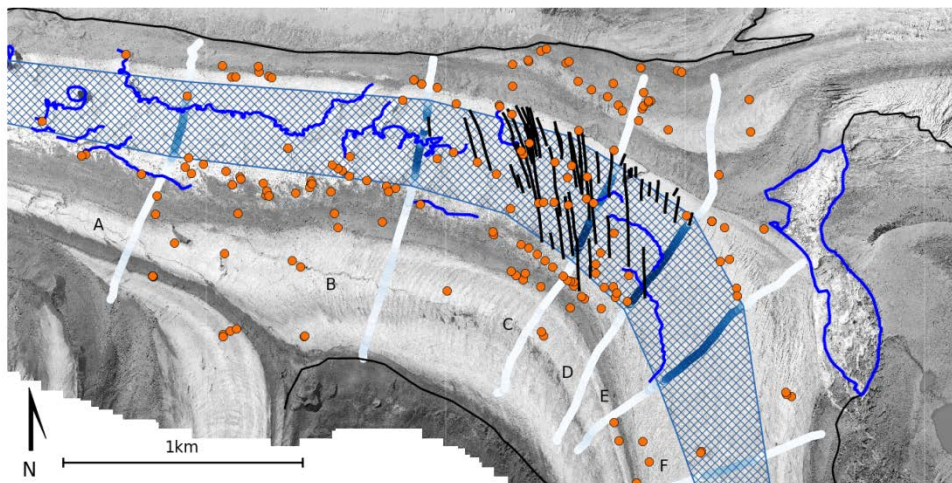


Figure 1: the extent of cold ice on the tongue of Gornergletscher.

The cold ice extent was delineated by radar-profiles (labeled A to F) which indicate temperate ice in white and cold ice in blue. The thin blue lines indicate deep melt-water streams and the outline of Gornersee. Moulins (orange dots) are common in the temperate part but nearly absent in the cold ice, except for the highly crevassed zone (marked by black strokes).

Key words:

Polythermal ice, ice radar, englacial temperature

Internet data bases:

http://www.vaw.ethz.ch/divisions/gz/projects_DE

Collaborating partners/networks:

Universität Münster, Institut für Geophysik
Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover

Scientific publications and public outreach 2012:

Refereed journal articles and their internet access

Ryser C., M. Lüthi, N. Blindow, S. Suckro, M. Funk and A. Bauder, Cold ice in the ablation zone: its relation to glacier hydrology and ice water content, *J. Geophys. Res.*, in press.

Address:

VAW
ETH Zurich
CH-8092 Zurich

Contacts:

Martin Funk
Tel.: +41 44 632 4132
Fax: +41 44 632 1192
e-mail: funk@vaw.baug.ethz.ch
URL: <http://www.glaciology.ch>