Recent state of the Svalbard glaciers with special reference to Southern Spitsbergen

(The AWAKE report, fall 2010)

J.A. Jania, M. Błaszczyk, M. Grabiec

Faculty of Earth Sciences, University of Silesia, Poland

The AWAKE Meeting

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   Presentation by J.A. Jania

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Photo by J.A. Jania,April 2005

WP 6: Ice Sheet and Glaciers

Task 6.2. Changes in Svalbard glaciers

Objectives: To understand of rheology of glacier and get basic data on glacier sliding, dynamics and to estimate number and volume of icebergs;

Activities: Modelling of glaciers dynamics, field observation of:

- Ice temperature structure;
- Subglacier water pressure;
- Glacier flow velocity, monitoring of cliff position changes, calving events, melting and water discharge;
- Energy balance and glacier mass balance.

High-resolution satellite images for the last two decades will be used to analyze outlet glaciers for estimation solid ice fluxes into the ocean and determination temporal and spatial variability in ice fluxes. Laser altimeter data will be used in combination with satellite images and ground precise GPS survey to estimate changes in elevation, frontal position and iceberg calving.

Deliverables: Model of response of tidewater glaciers to climate and sea warming. Data on meltwater and iceberg supply from Svalbard glaciers to surrounding seas.

Photo by J.A. Jania,

Plan for 2010 from the Minutes of the AWAKE KoM in January

- Series of satellite ortophoto maps will be prepared as the base maps for compilation of all observational data and modeling (L. Kolondra, M. Blaszczyk) [done and in use]

- Already collected radio-echo soundings of couple of glaciers in different part of Spitsbergen will be examined to obtain picture of glacier ice hydrothermal structure. Stage 1 for the Southern Spitsbergen area will be prepared in 2010 (M. Grabiec). [done]

- Two field campaigns are planned in 2010 and similarly in 2011 to prolong instumental observations of mass balance, water balance and dynamics of target glaciers (Hansbreen – tidewater glacier and Werenskioldbreen – land based glacier). (J.A. Jania *et al.)* [the majority of planned works done in 2010 – *see the next page*]

Plan for 2010 ctd.

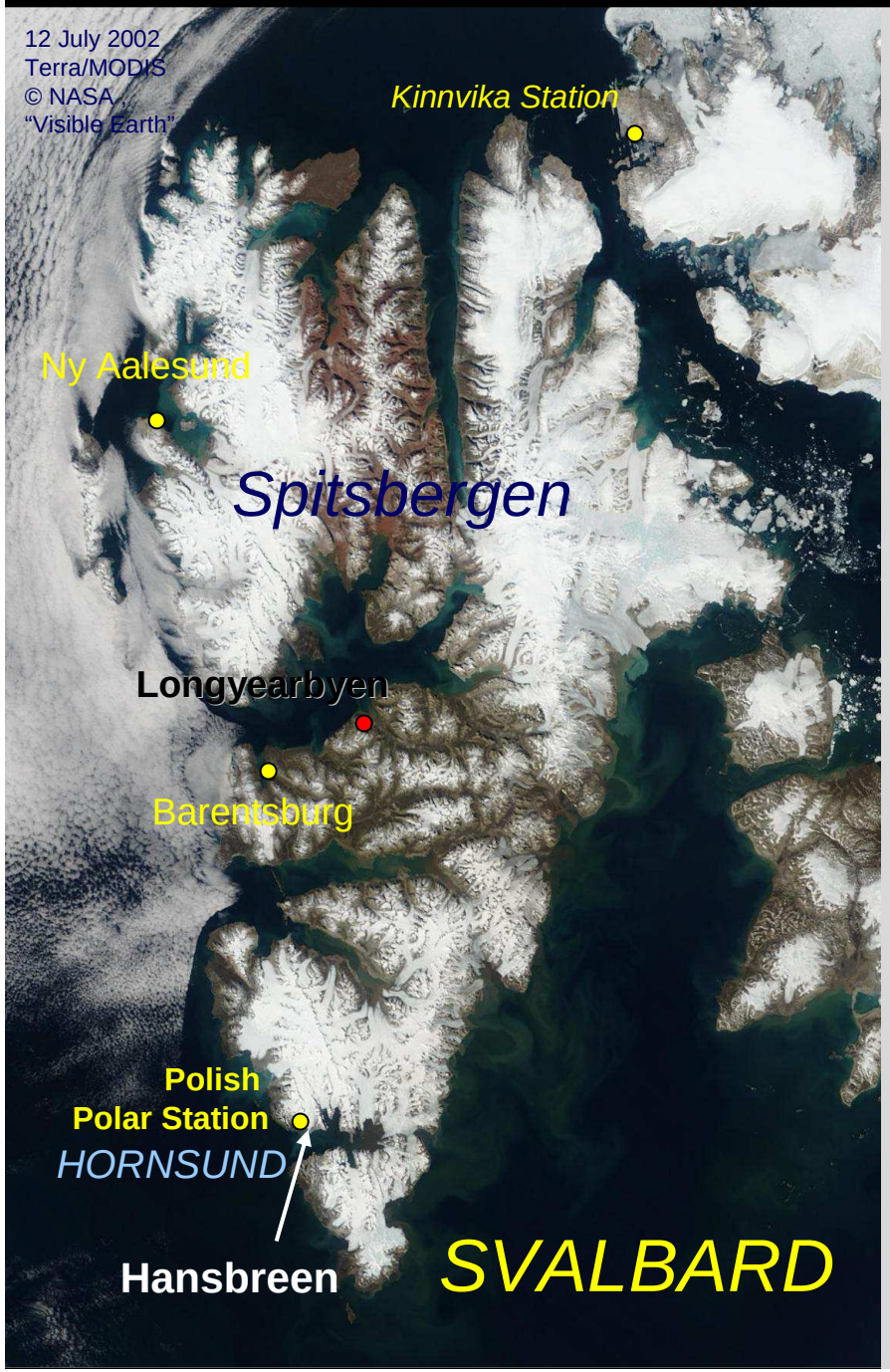
The following elements of water balance and iceberg calving process will be surveyed and / or continuously recorded during field campaigns:

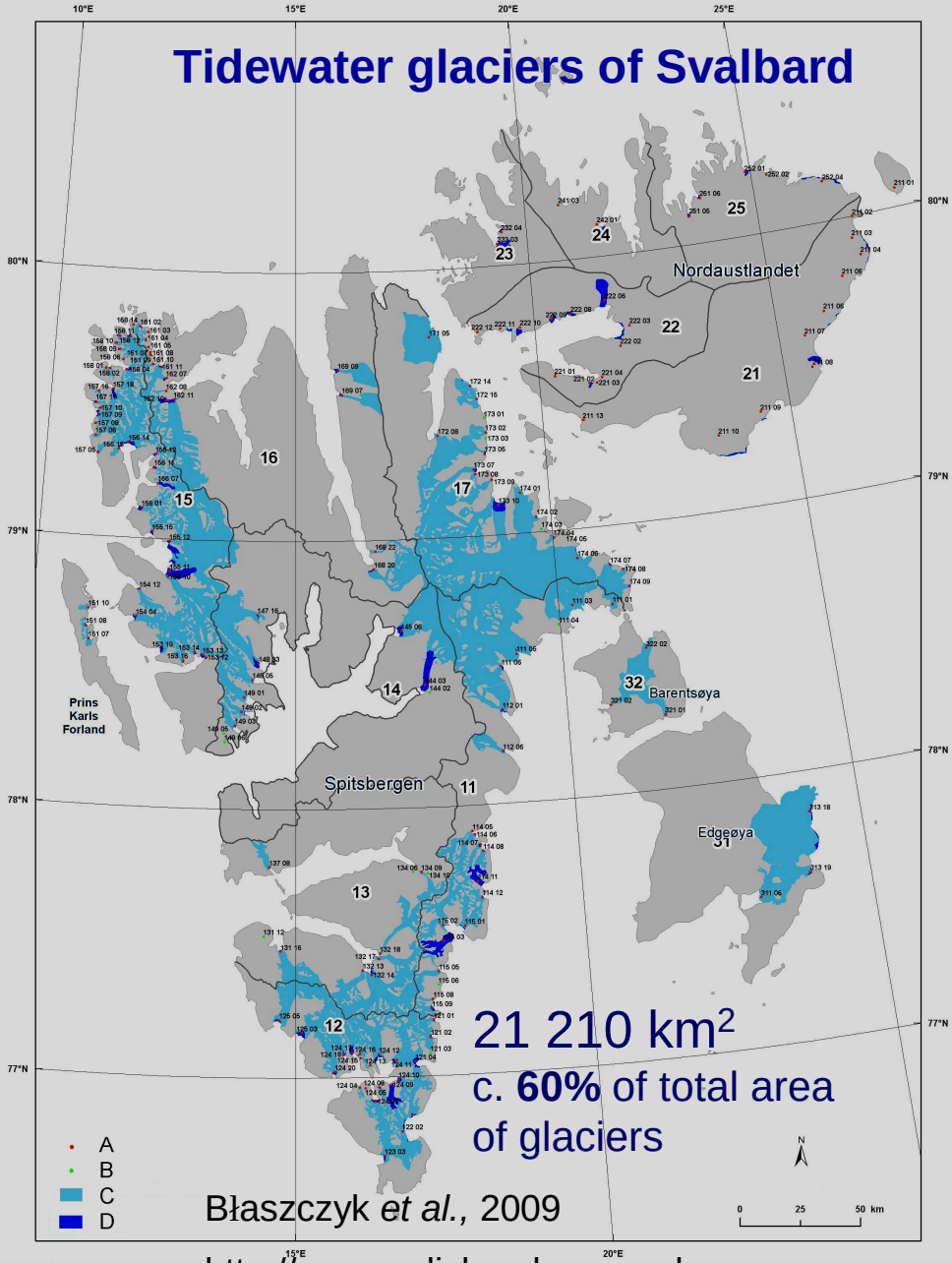
1) Hans Glacier ice flow velocity by repeated precise GPS survey and time lapse stereoscopic pictures (continuation of monitoring, using new, more sensitive time lapse cameras), also for monitoring of glacier ice-cliff changes (J. Jania, L. Kolondra, D. Ignatiuk) [ongoing record and progress in analyses]

2) Subglacier water pressure underneath of Hansbreen using recovered Polish-Canadian stations or new sensor implanted underneath of glacier by drilling [partly done]

3) Registration of glacier mass balance for Werenskioldbreen and Hansbreen together with ice surface energy balance basing upon new installed in 2010 AWS record will be used for calculation of water balance components – empirical data (D. Ignatiuk, T. Budzik). [stations established and working; mass balance data collected]

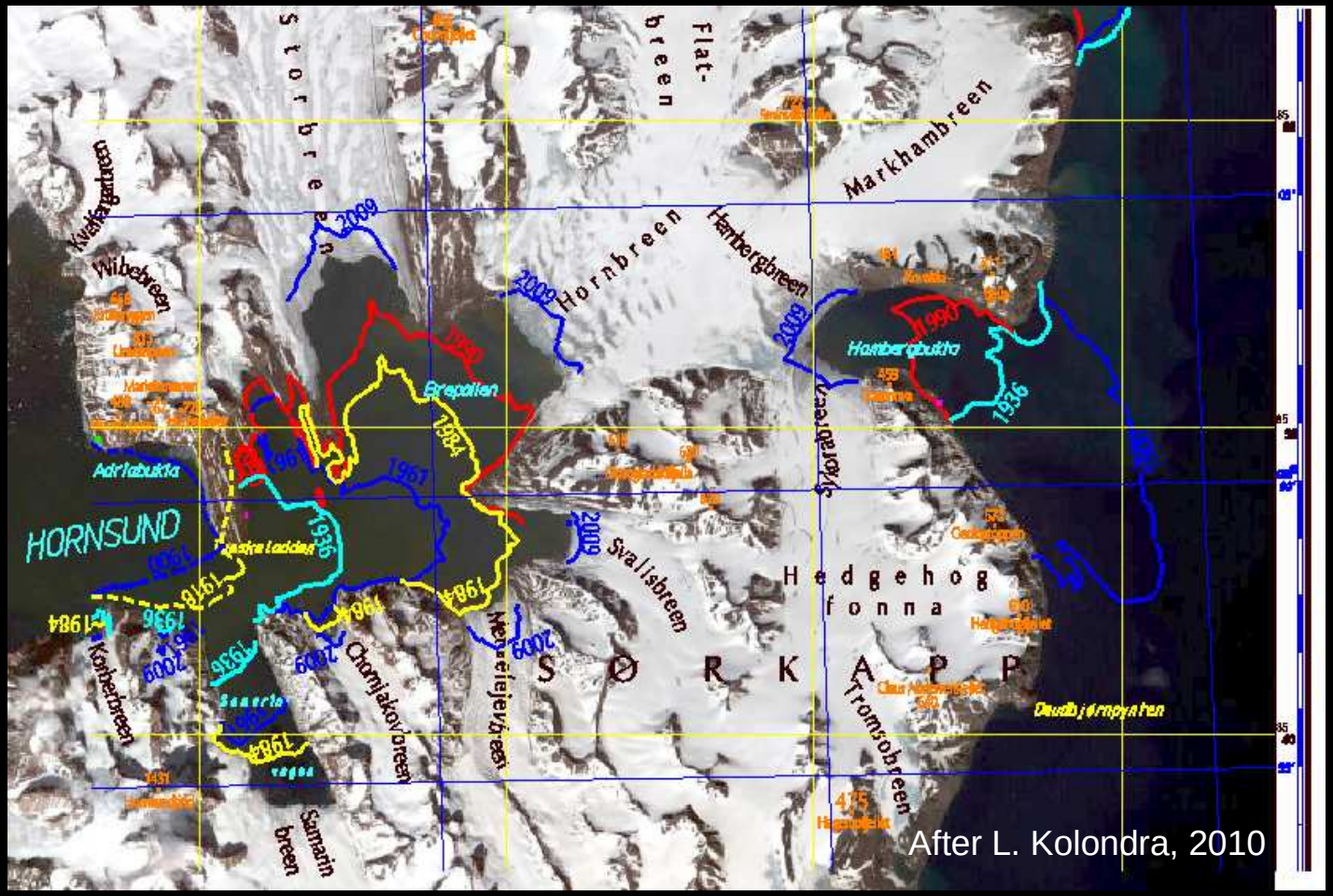
4) Registration of melting intensity by SR50 sensors and record of meteorological conditions on Hansbreen by the AWS for modeling of meltwater production (T. Budzik, D. Ignatiuk, A. Piechota). Previous estimations and model by B.A. Piwowar et al. will be tested and verified in 2010 and 2011. [partly done and data under analysis]





http://www.polish.polar.pan.pl

Recession of tidewater glaciers on satellite orthophoto map of S Spitsbergen

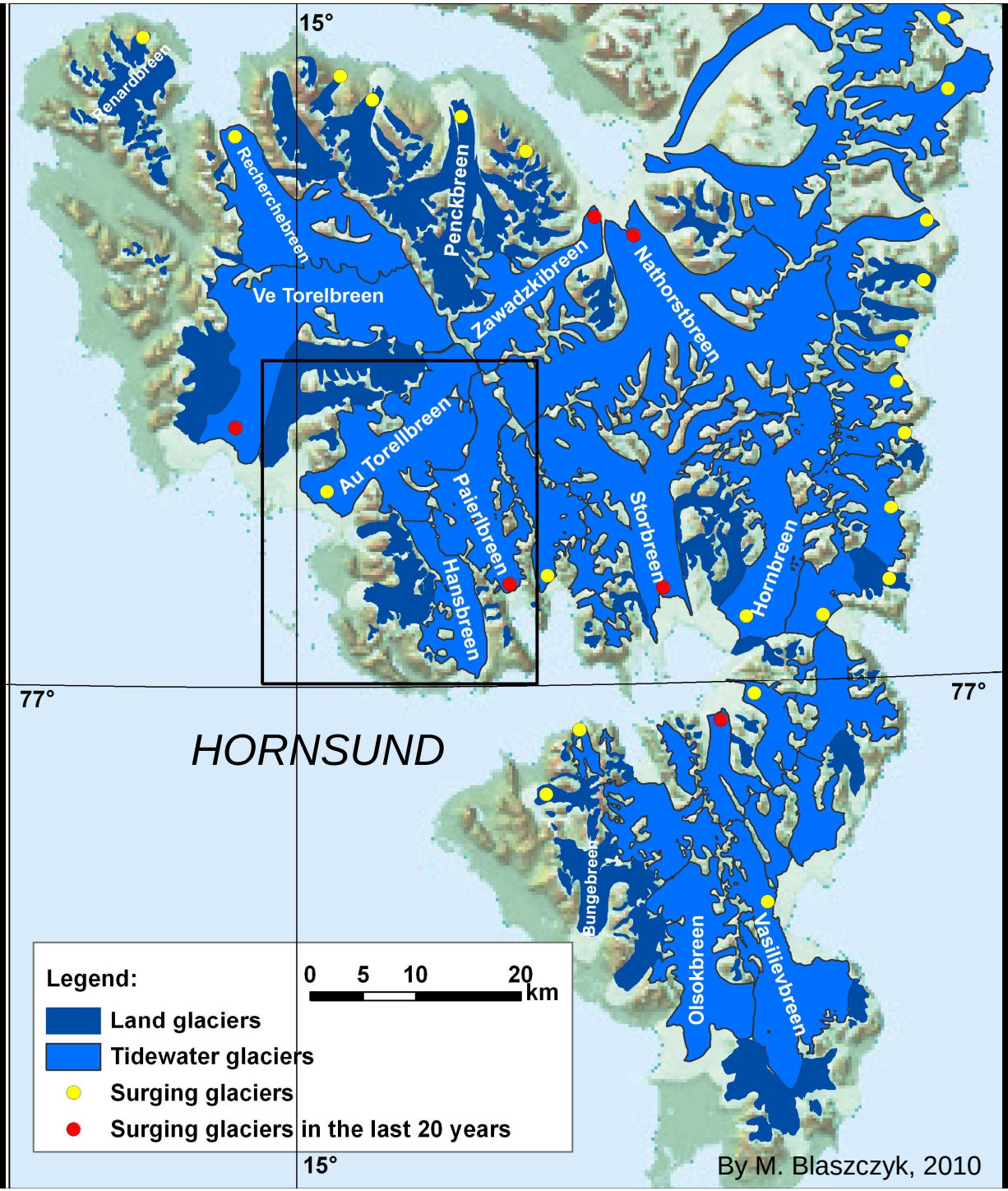


Diminishing of tidewater glaciers emptying into Hornsund Fiord

Period	1936 -1960/61	1960/61 -1984	1984 -2005	2005 -2009
Area reduction rate (km^2/yr)	-1.0	-1.4	-2.4	-2.9

After J.A. Jania *et al., 2010*

Glacier inventory of Southern Spitsbergen



Radio-echo sounding of selected glaciers

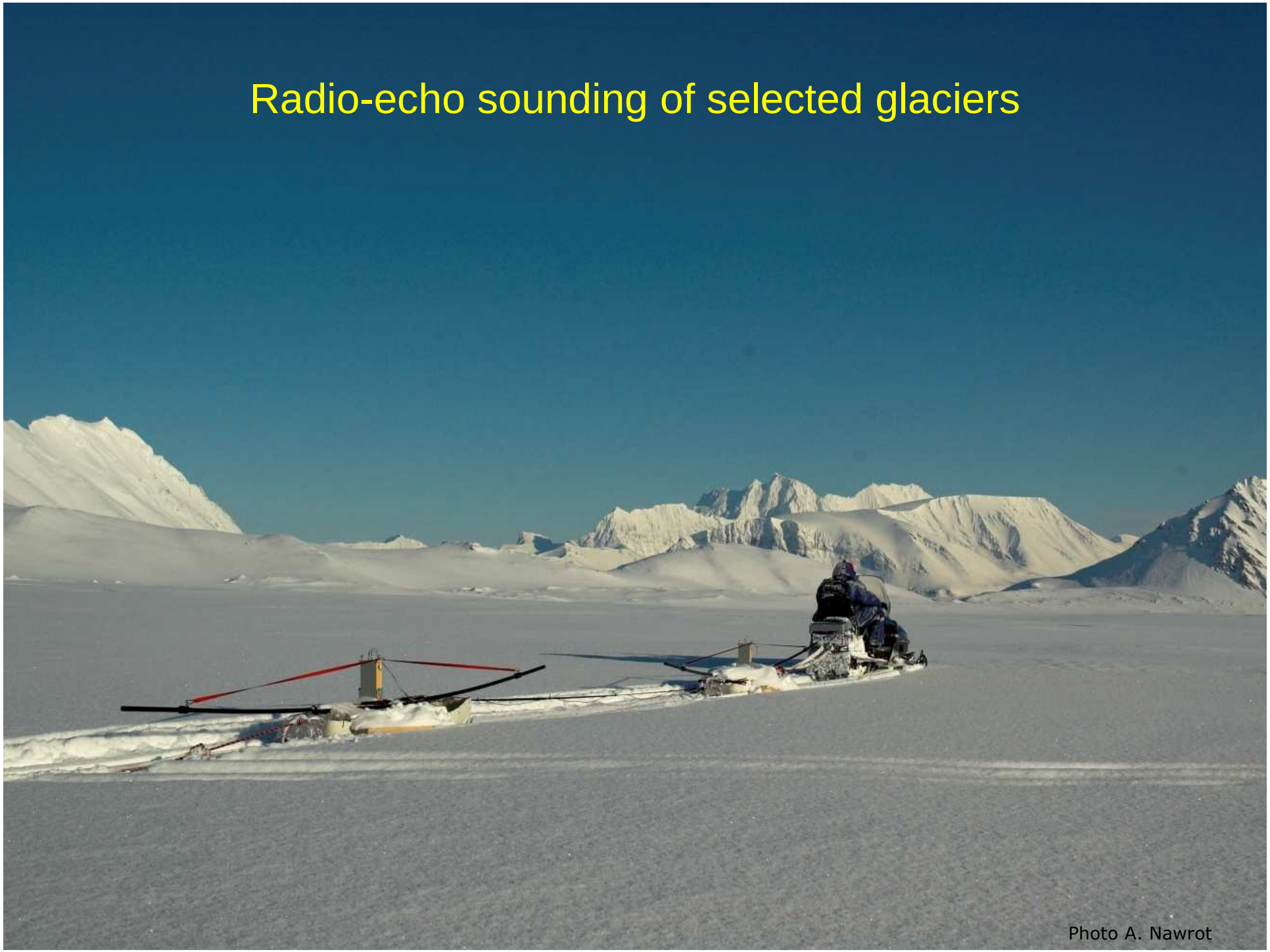
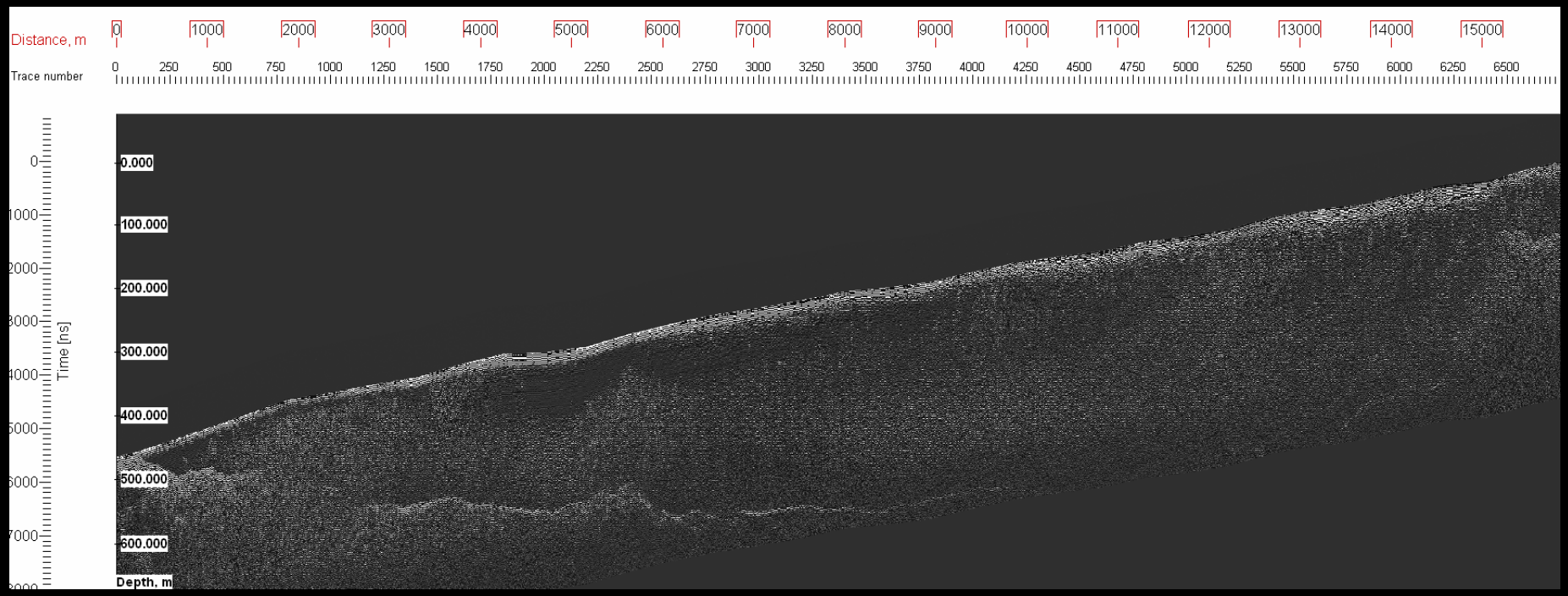
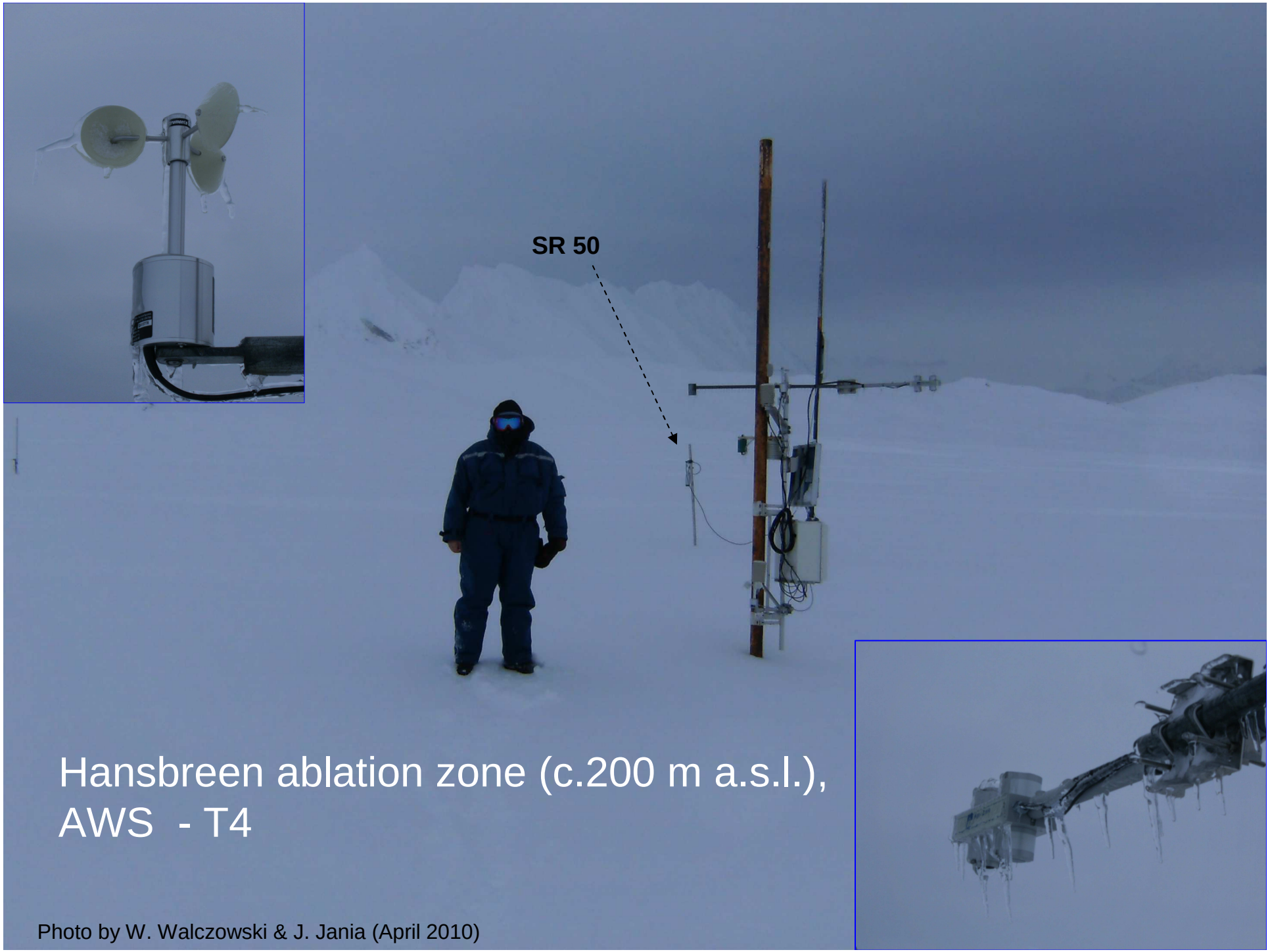


Photo A. Nawrot

Hansbreen longitudinal profile from GPR



By M. Grabiec (GPR 25 MHz, RAMAC + GPS Leica 1200)

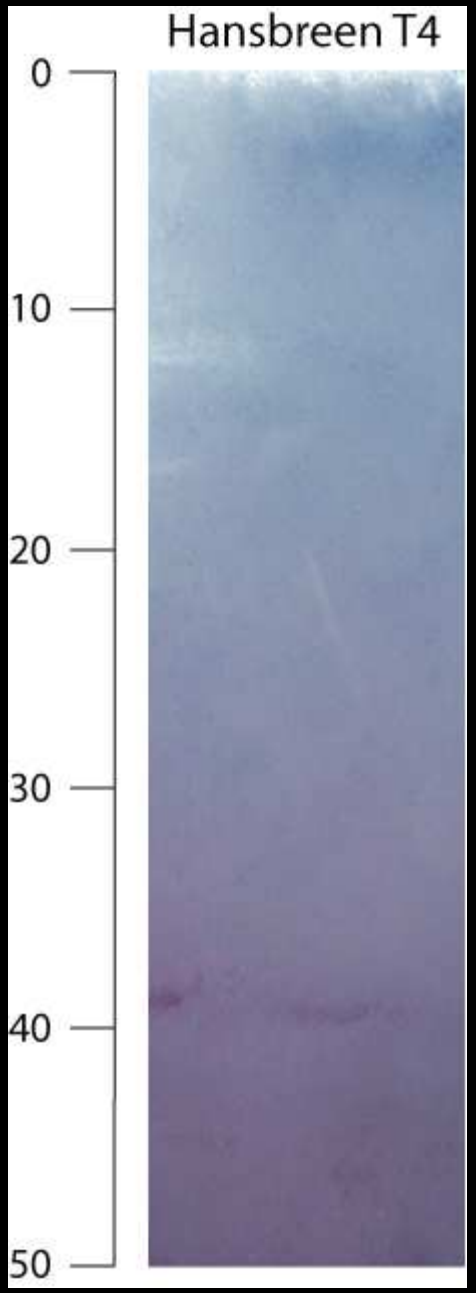


Hansbreen ablation zone (c.200 m a.s.l.),
AWS - T4

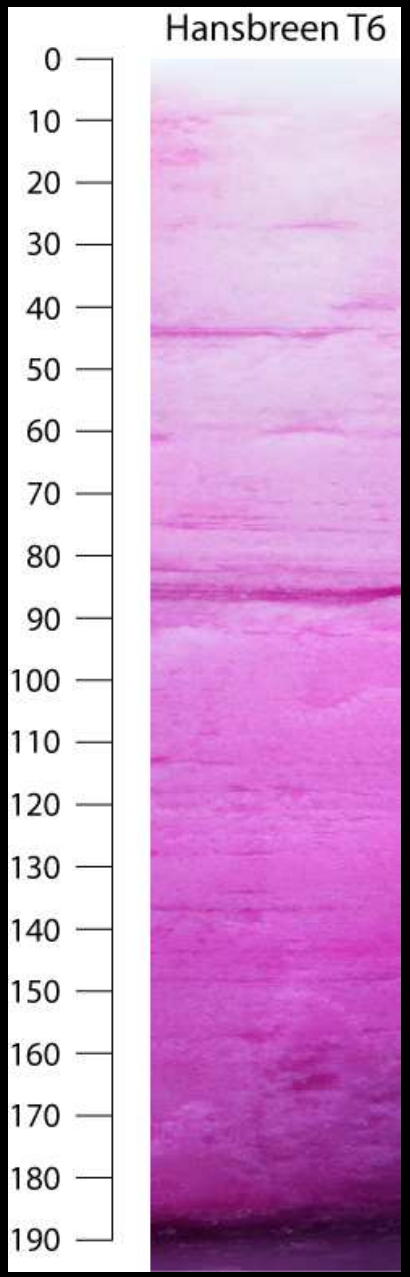
Photo by W. Walczowski & J. Jania (April 2010)

Retention and percolation processes within snow cover on a glacier
(an experiment in 2010)

By M. Laska & J.A. Jania



30 June 2010



25 May 2010

Photo by J.A. Jania, September 2010

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