User Manual

Snow profile

This User Manual was created by the Austrian Avalanche Warning Services. For inquiries and reactions, please write to us at lawis.cartography@univie.ac.at and lawine@tirol.gv.at.

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LAWIS …

...is a tool to record and store meteorological measurements, avalanche events and snow profiles. It is made available by the Austrian Avalanche Warning Services in cooperation with the Institute of Geographical and Regional Research of the University of Vienna. The data which have been recorded are graphically presented and are freely accessible on LAWIS. The wide-ranging data network can be easily and intuitively used with various search and filter options, as well as topographical maps.

Data base of profiles

The data base of profiles serves as a collection of information and work of reference. It provides to a wide audience insights into the development of the snow cover as it unfolds over time. The category Profiles is a fundamental category of LAWIS. Thus, it is coordinated both visually and technically to the two other categories, Events and Stations. LAWIS offers the opportunity to sort and record snow profiles. If you have made a snow profile, you can enter the collected data in LAWIS as a contribution to the completeness of the profile data base. All data are additionally controlled by the authorised Avalanche Warning Service.

Here's how to reach LAWIS-Profile

LAWIS: https://www.lawis.at/profile/

EAWS: https://www.lawis.at/profile/index.php

Avalanche Warning Service Tirol: https://lawine.tirol.gv.at/schnee-lawineninfo/schneeprofile/

Avalanche Warning Service Styria: http://www.lawine-steiermark.at/wetter/stationsdaten-lawis/

Avalanche Warning Service Upper Austria: https://www.land-oberoesterreich.gv.at/was_lnw_schneeprofile.htm

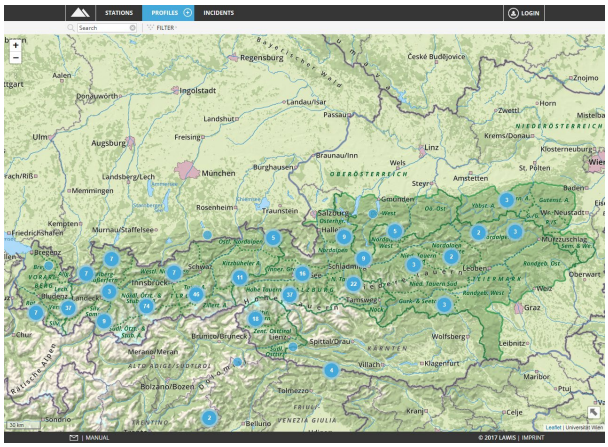
Avalanche Warning Service Carinthia:
http://www.lawine.ktn.gv.at/144600_DE%2dLawinenwarndienst%5fKaernten%2dSchneeprofil%5f%2d%5fArchiv

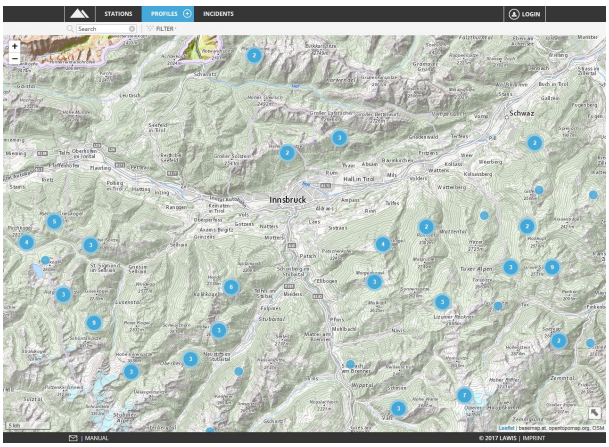
Avalanche Warning Service Salzburg: http://www.lawine.salzburg.at/cmsnew/daten.php?daten=2

Avalanche Warning Service Vorarlberg: http://warndienste.cnv.at/dibos/lawine/

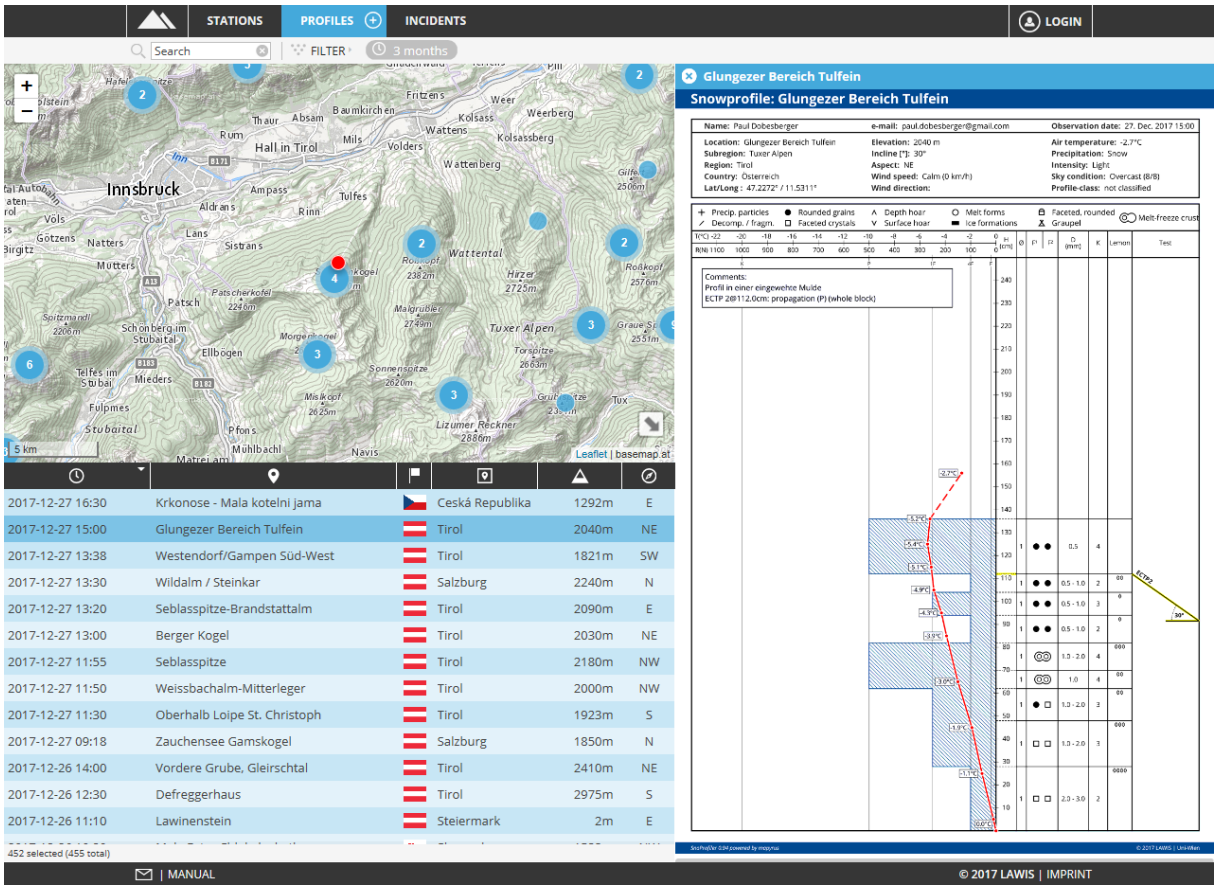
1. Finding profiles

A profile can be located and pinpointed by scrolling or clicking the coloured circles which are numbered in the calendar depiction. To start with, any circle can be selected. The illustrations display various depictions of the search as it is being carried out.

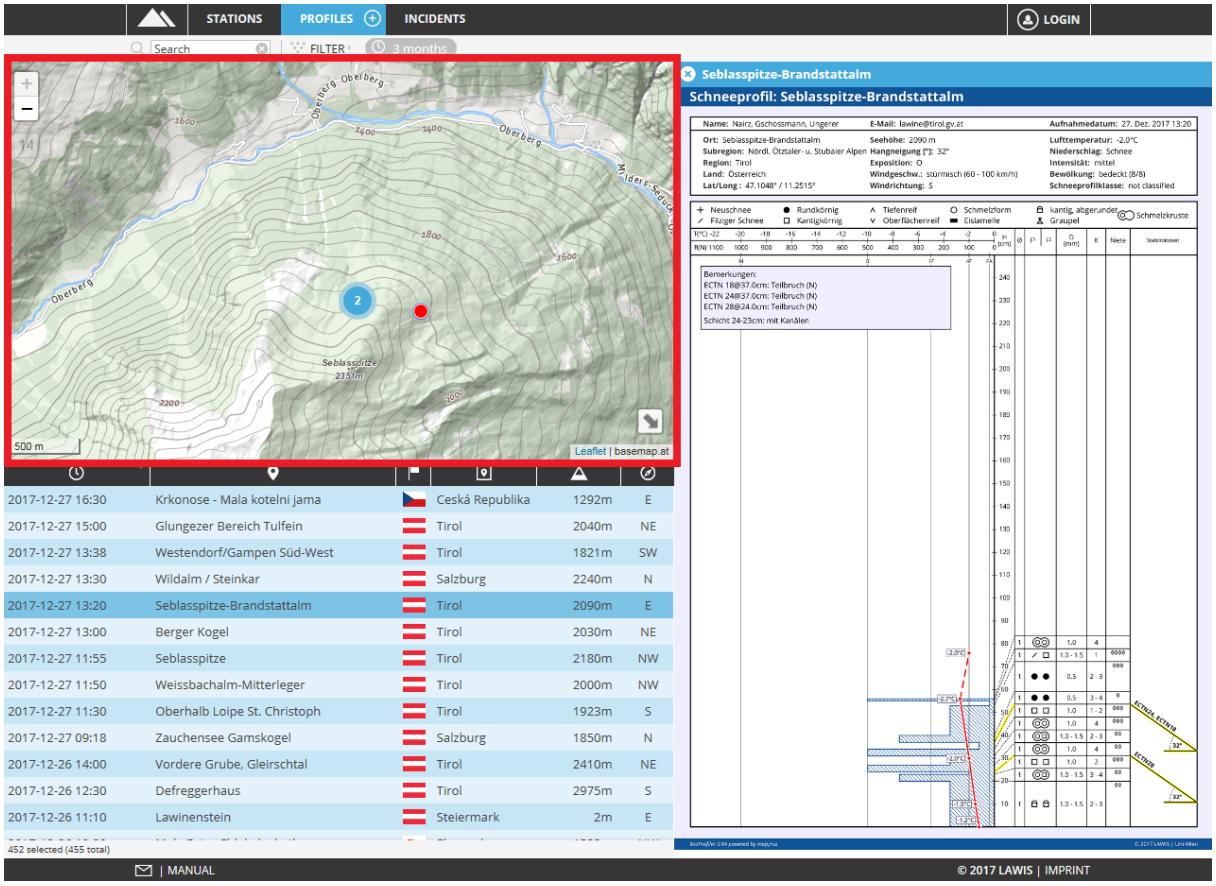




In the view below, various tools are available for your use to make locating the desired profile easier and quicker. It is utterly up to you whether you use a list, map, search or filter to find what you seek. How the search functions with the various tools is explained on the following pages.

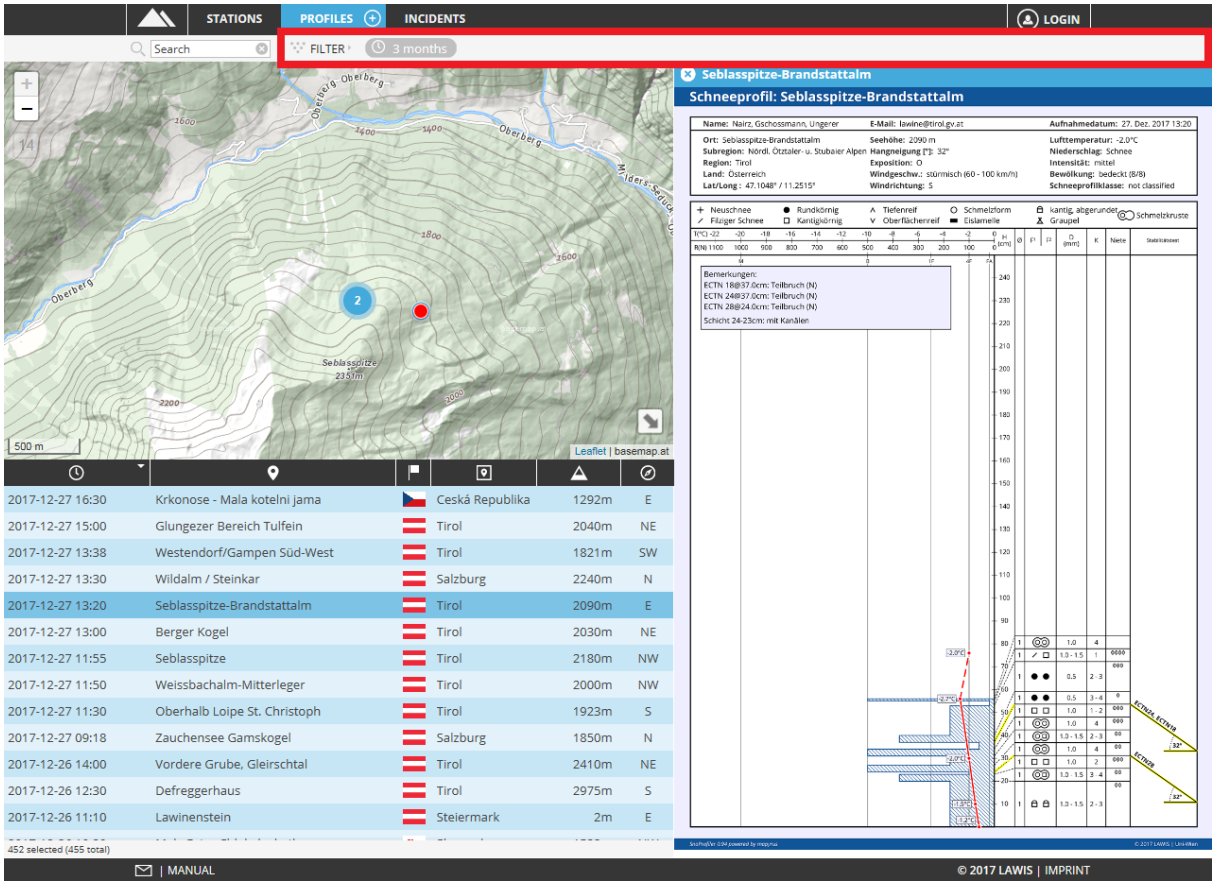


1.1. Locating profiles with a map

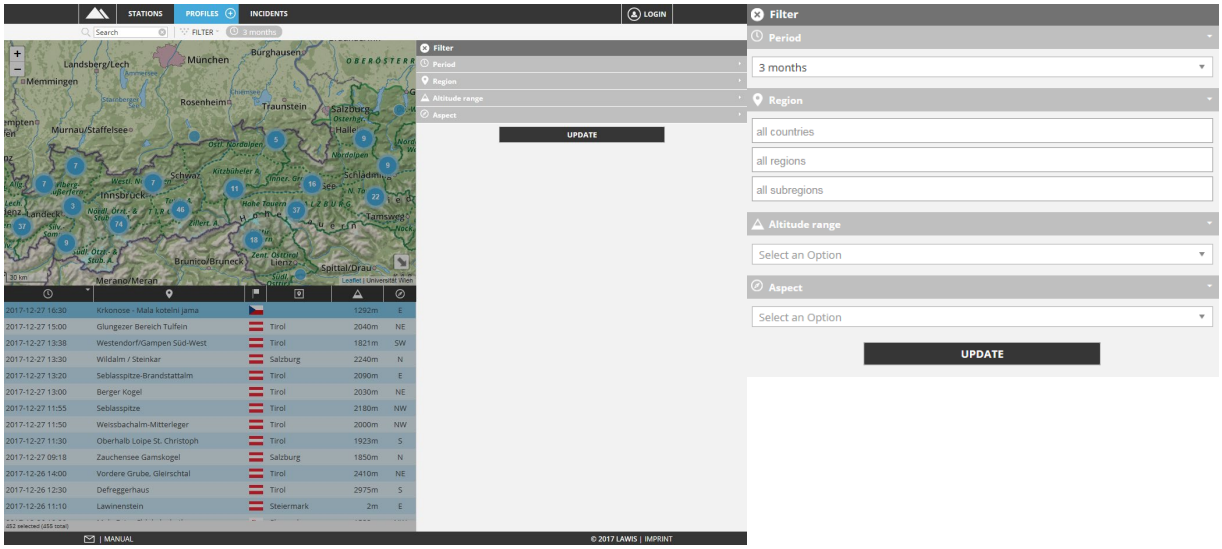


The map expanse serves as an overview and orientation of where snow profiles have been taken. The interactive design of the map makes it possible for users to slide the map or zoom in and out. By clicking onto a profile, the corresponding point on the map is marked in red. Making this selection also leads to opening the data base at the right.

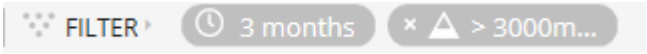
1.2. Locating profiles with a filter



After selecting the filter, a gray-marked area opens in the right margin. Here you can specify the time window, region, altitude and aspect. By selecting the “update” space, the selected filter criteria are carried out. Only those events are shown which fulfil the selected criteria.



As soon as you have selected your filter criteria, you can see the selected filter criteria above the graph. They are marked in gray.



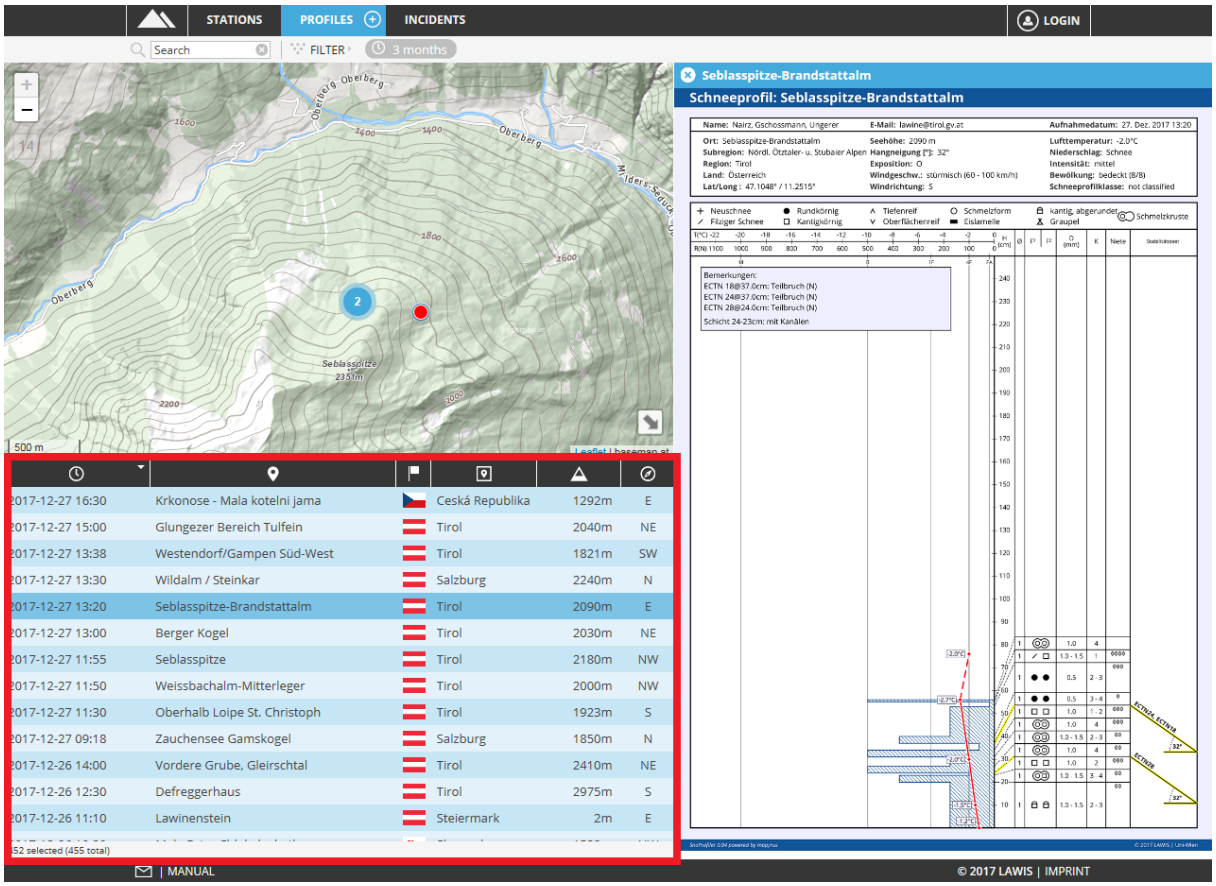
If the event you are seeking is not found among the selected criteria, you can remove the individual filter criteria with one click on x (to the left of each criterium).

1.3. Locating profiles with a list

By clicking the icons between the depiction and the list, you can sort the searched-for results according to date, town, province, region, altitude, aspect, danger level in either ascending or descending sequence.

By scrolling up or down it is possible to view the overall contents of the list. In the pale gray-marked space beneath the list you can see whether the entire data base is contained in the list or only a reduced amount of data was selected. 9 selected (455 total)

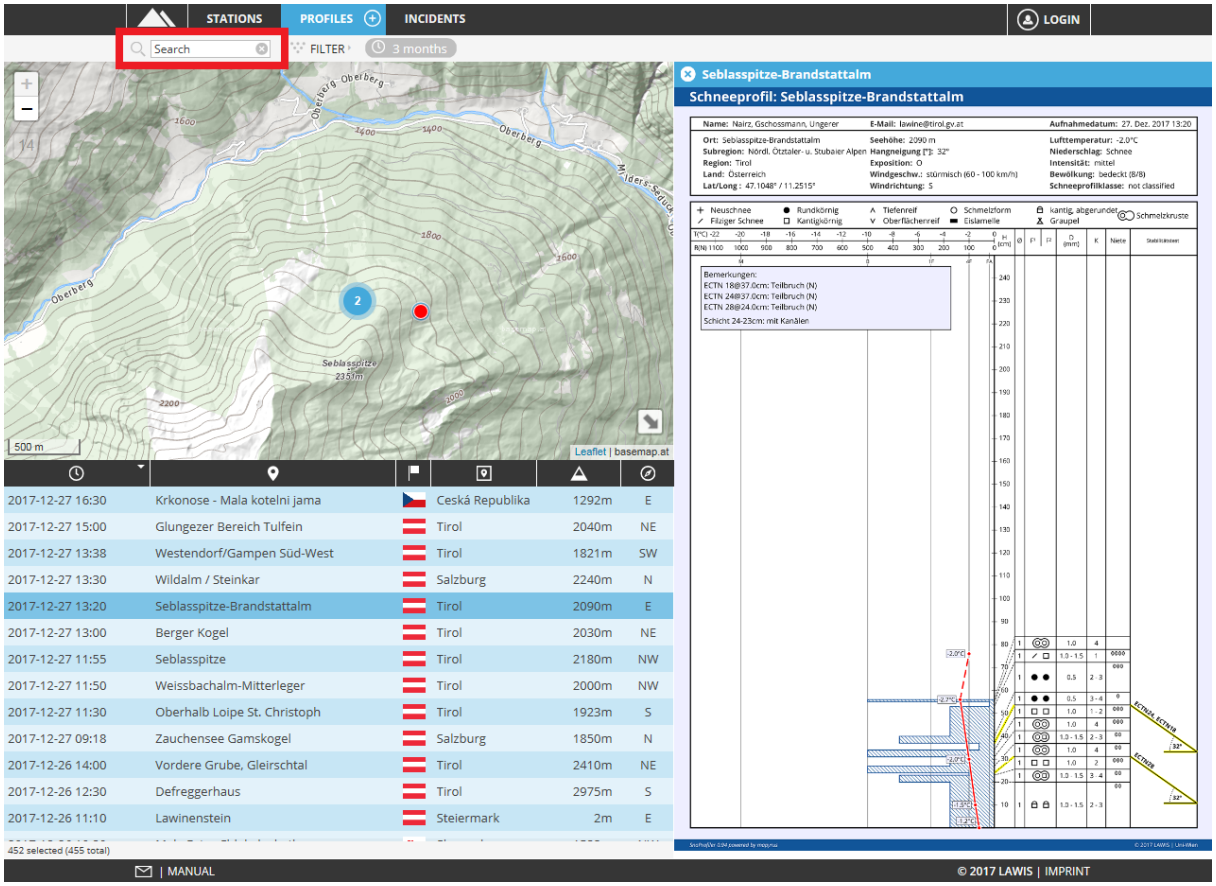
The profile is selected by clicking on it. The corresponding profile then appears to the right of the map and list.



1.4. Locating profiles with a search machine

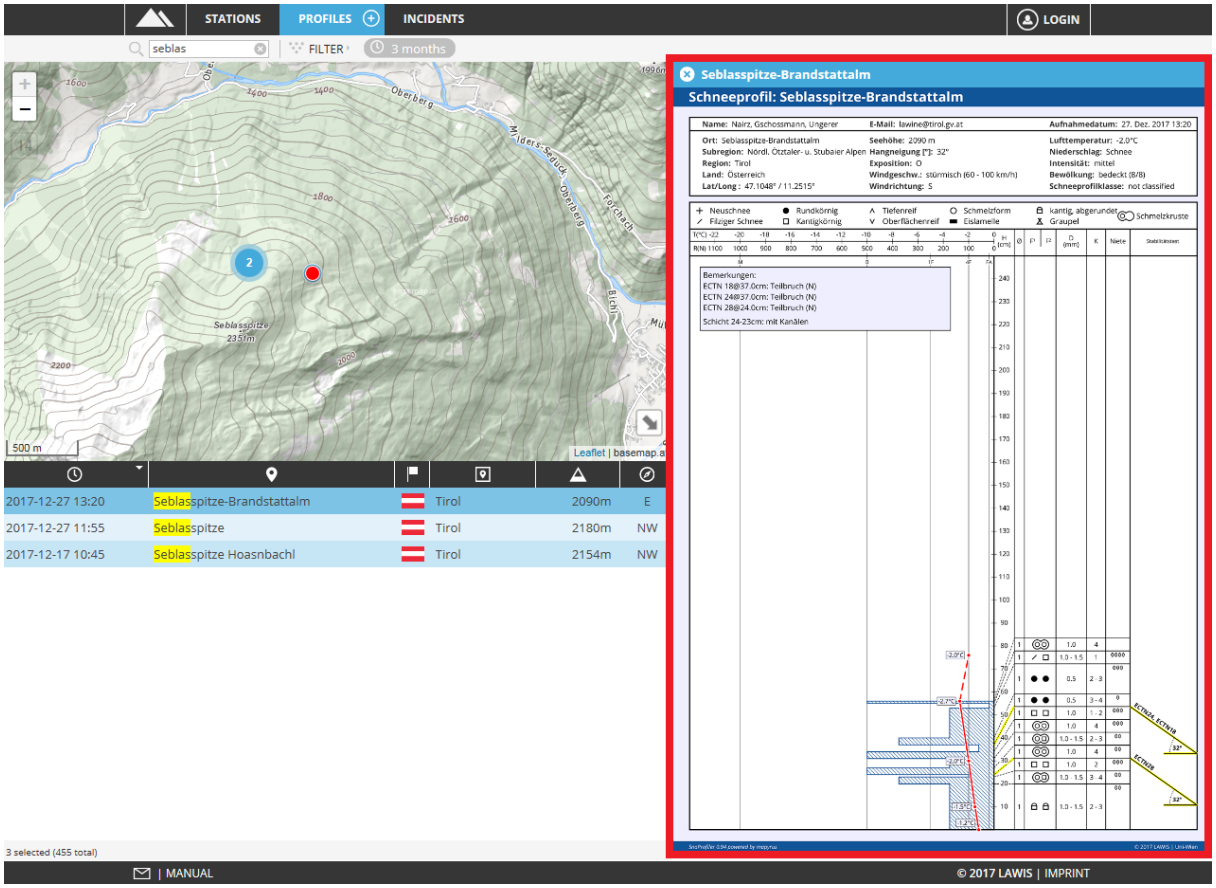
The Search space is at the upper left. 

If name, region or subregion of the searched-for event are known, the appropriate search word can be entered here. LAWIS filters all results and displays the list of objects found beneath the graph. The filters are automatically adapted.



2. Profile details

If the searched-for profile is located with map, filter, list or search machen, a graph of the profile opens in the space to the right.



All data compiled are reflected in the description. By clicking in the upper left corner, the information about the profile can be closed again.

By clicking on the profile, a new tab opens in which the profile is depicted over the entire monitor screen and can be downloaded as a PDF file.

2.1. Explanation of stability tests

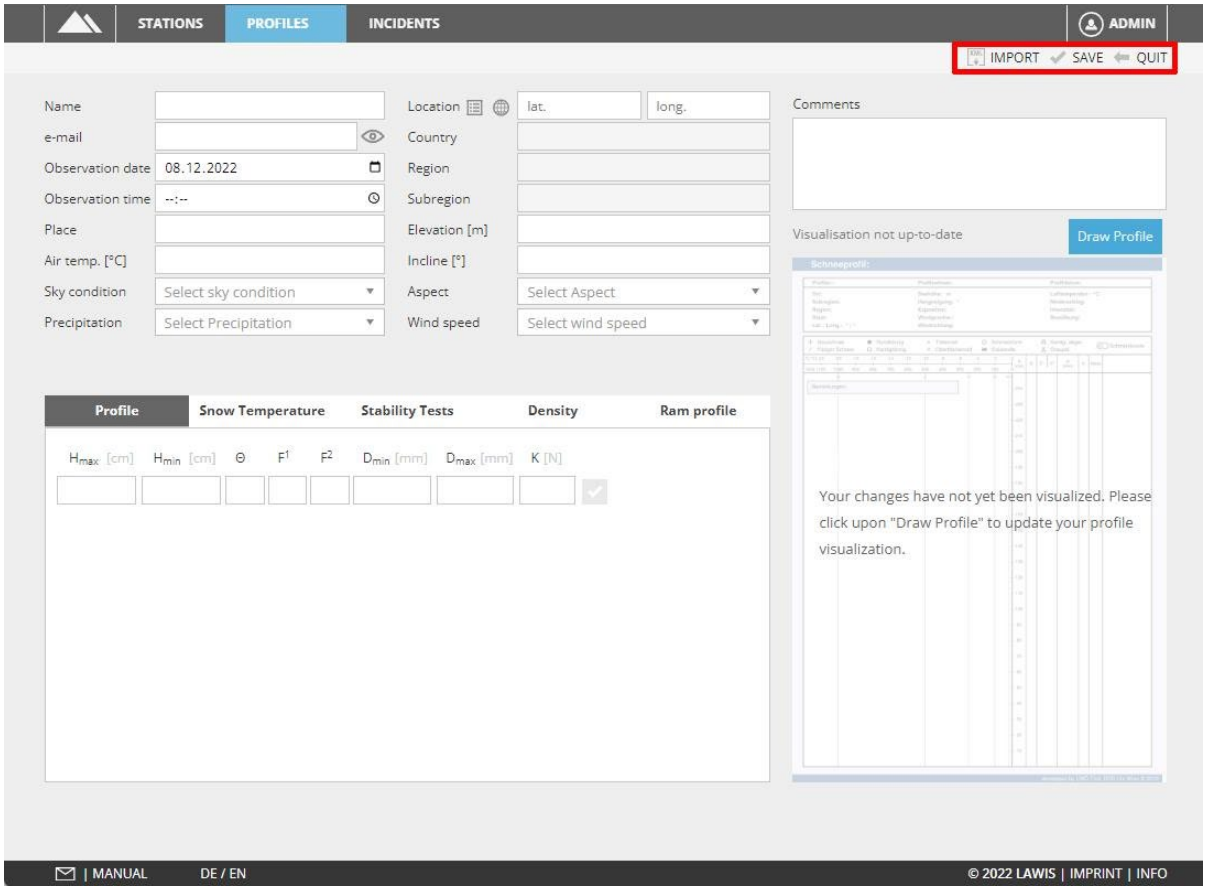
Code	Name	horizontal measurement	No. of strikes/force level
CT	Column Test	30cm x 30cm	0-30
ECT	Extended Column Test	90cm x 30cm	0-30
RB	Rutschblock	150cm x 200cm	1-7
KB	Kl. Blocktest	40cm x 40cm	0-3

N = partial fracture, P = entire fracture, @ = “at an altitude of”

3. Generating a new profile

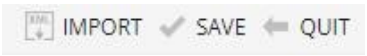
If you have dug and cut a snow profile, you can enter your collected data in LAWIS as a contribution to the completeness of the profile data base. The basis of this data base is a so-called crowdsourcing principle. All data is additionally controlled by the authorised Avalanche Warning Service.

In the top line next to the Profile space is an plus-sign in a circle. Select this by clicking on it to be transferred to Entry Modus.



Please fill out all spaces truthfully and accurately.

Once you have completed entering details of the profile, please click on the SAVE space above right to save the data. If you wish to interrupt the process and return to the general collection of events, please click on the space BACK. If you wish to load a profile from an XML file, select the space IMPORT.



3.1. Explanation of entry spaces

Name/ E-Mail: These are mandatory spaces, so that Avalanche Warning Services can contact observers if necessary.

Date of profile: The current date is displayed. Correct this if the profile was taken on another date.

Time of profile: Enter the current time.

Location: This can be scree, a gully, a valley or a town name.

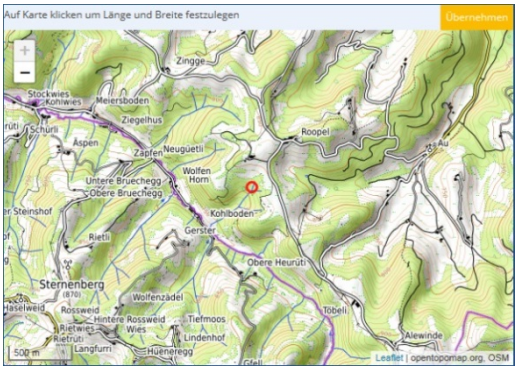
Air temperature: This is the meaured air temperature. Try to measure the temperature at approximately 2 meters above the ground and at least 2 meters distant from warm objects, e.g. persons, tea, cigarettes.

Cloud cover: Please select from among the possible options. The cloud cover is displayed in eighths. Take into consideration the entire visible dome of the sky. For your observation please select a location which is without visual impediments. To determine the correct eighth, cloud cover density is irrelevant. Thus, it is possible for it to be a sunny day, yet with a completely closed (8/8) cloud cover (when cirrostratus clouds cover the sky).

0/8	no clouds visible
1/8	e.g. only isolated jet stream vapour trails of airplanes, from the vantage point of the observer one eighth of the sky is covered
5/8	more than 50% of the sky is covered with cloud
8/8	the entire sky is covered with cloud

Precipitation: Please select from among the possible options.

Location: If you do not know the coordinates of the event, a profile location list and an interactive map are available in order to pinpoint the exact spot of the event.. Click on “Accept” above right to accept the spot you have selected as the location of the event.



Altitude: Meters above sea level

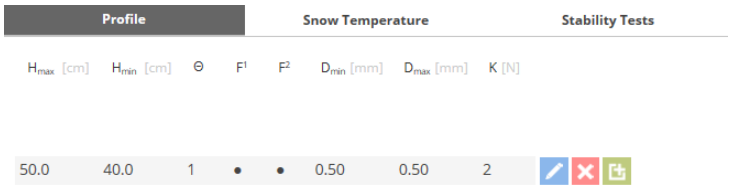
Slope gradient: Slope gradient (angle) in degrees, at the fracture point of the avalanche

Aspect: Please select from among the possible options.

Wind strength: Please select from among the possible options.

Comments: Do you have other information for us which is not addressed in the regular questions? If so, please enter your comments here or write us an email.

3.2. Entering a snow profile

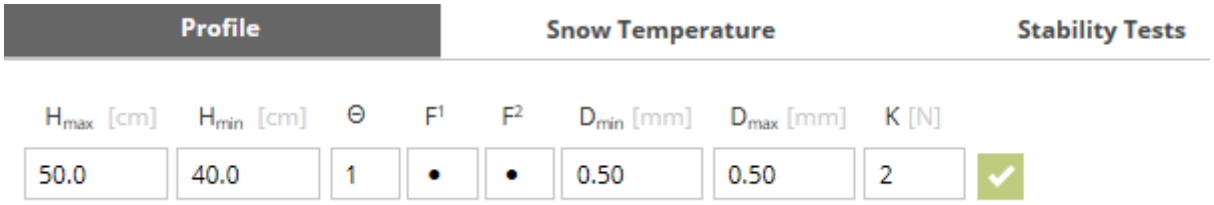


If you glide the mouse over the icon or abbreviation without clicking it, a space appears with a precise designation / explanation.

With  you can change your entry, delete it or begin a new line.

By clicking  you confirm your entry.

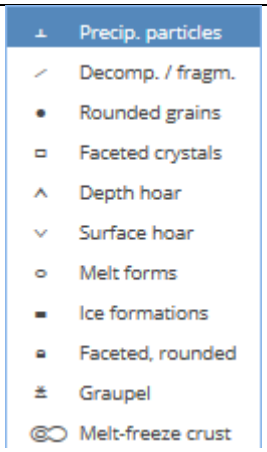
Please enter the individual snow layers from above-to-below.



After entering the upper/lower limits of the snowpack layers, the moisture, grain shape, diameter and hardness, by clicking on the green-highlighted check each individual layer is confirmed and saved. In order to ensure that each snowpack layer is saved it is advisable to click on  above the profile graph. The profile is then updated and drawn anew.

3.3. Explanations of entry parameters of snow profile

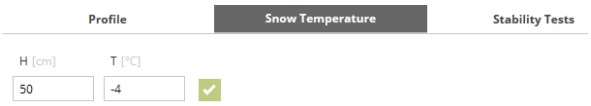
Value	Possible entry	Explanation
H_{max} [cm] and **H_{min} [cm]**	0 to 1000	H_{max} → perpendicular distance from **upper** layer border to ground in cm H_{min} → perpendicular distance from **lower** layer border to ground in cm
θ	1 - 2 - 3 - 4 - 5	1 → **dry** snow below 0°C

		2 → **weak** moist snow 0°C; sticky 3 → **moist** water can be seen ; no drain-off 4 → **wet** saturated; water drain-off 5 → **very wet** saturated with water
F^1 and **F^2**		**Grain shapes:** F^1 – predominant grain shape F^2 – subordinate grain shape *Comment 1:* if only one grain shape is present → $F^1 = F^2$ *Comment 2:* when entering a melt-freeze crust, F^1 is always the melt-freeze form. Beyond F^2 another grain shape can be entered.
$D_{min\ [mm]}$ and **$D_{max\ [mm]}$**	0,25 - 0,5 - 1,0 - 1,5 - 2,0 2,5 etc.	**Grain size:** D_{min} → size of the smallest grains D_{max} → size of the largest grains **Normal sizes:** fresh snow: 1-3 mm fuzzy snow: 1-2 mm round grains: 0.25-0.5 mm faceted grains: 1-3 mm depth hoar: 2-5 mm surface hoar: 2-5+ mm melt-freeze shape: 1-5 mm faceted, rounded: 0,5-3 mm graupel: 0.5-3 mm
$K_{[N]}$	1 to 6	**Snowpack hardness** 1 → **fist** [FA] very soft 2 → **4 fingers** [4F] soft 3 → **1 finger** [1F] medium-hard 4 → **pencil** [B] hard 5 → **knife** [M] very hard 6 → **ice** [-] compacted

Please note: the rivets generated for each layer of snow (shown in the column on the right next to hardness K) serve to evaluate the borderline to each layer. The more rivets the borderline to a layer has, the more unfavourable is the assessment of this layer.

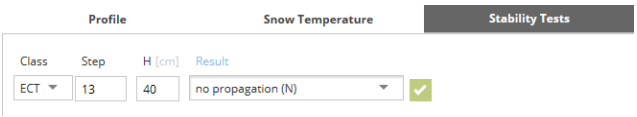
3.4. Entering snow temperature

Please enter here the measured snow temperatures (ideally, 10 cm apart). The air temperature has already been isolated and entered in the general data. You can omit the minus sign when entering the temperatures, since this is automatically generated.



3.5. Entering stability tests

Please select the type of test which has been conducted: CT, ECT, RB or KB.



Compression Test (CT)

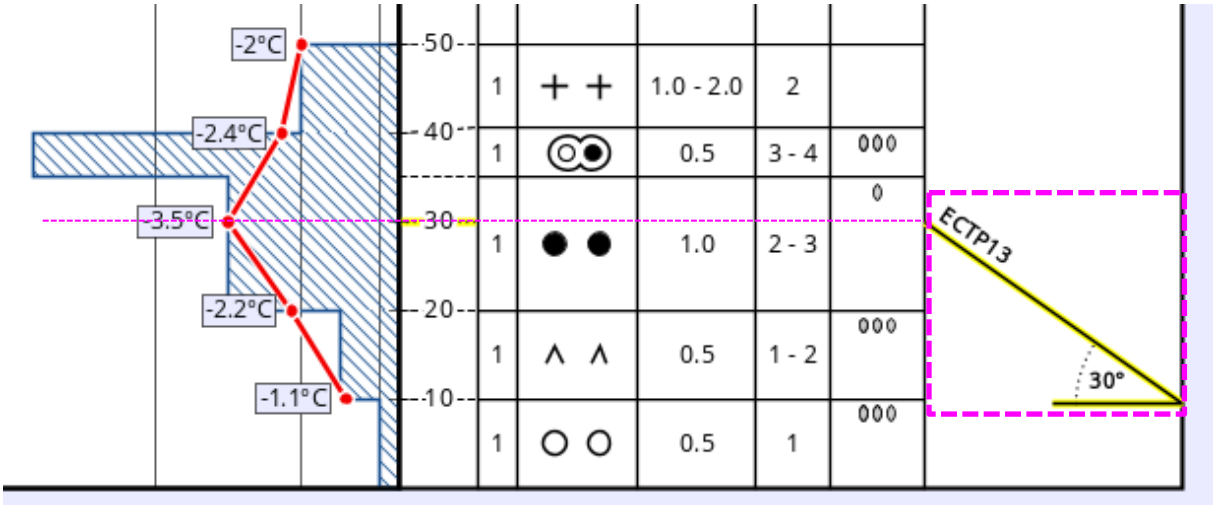
The CT serves primarily to diagnose a weak layer. It is one of the quickest tests to carry out. However, it is less "reliable" than the rutschblock test or the ECT, since it supplies no information about *fracture propagation*. Nevertheless, it enables us to determine whether there are weak layers inside the snowpack which additional loading could cause to collapse. For a CT, a 30 x 30-cm large cube or pillar of snow is removed. Weight/force is placed on it by a snow shovel (flat spade) in increasing degrees. The thrust from the wrist and the elbow comes when the hand is held flat, from the shoulder joint, then with the fist. The steepness of the relevant spot should be about 35°.

CT0@… pillar fractures through digging or sawing
CT1-10@... fracture at 1.-10. weight (from wrist)
CT11-20@... fracture at 11.-20. weight (from elbow)
CT21-30@... fracture at 21.-30. weight (from shoulder)
CT31… no fracture, pillar remains stable

The number after the CT (=class) designates the level of weight/force (=level). The value after the @ designates at what height (=$H_{[cm]}$) inside the snowpack the fracture was initiated. In addition, please also record the type of fracture (=result), namely, whether it was a fracture with varying types of resistance (RP, RC, B), a sudden fracture with a smooth surface (SP) or a collapse (SC).

As before, the entry is confirmed by clicking the icon.

Example: CT23@81 means a fracture which was located 81 cm above the ground was triggered at the 23rd level of weight inside a weak layer.



Both for CT and for ECT, a fracture was initiated at the 13rd impulse (3rd degree of force from the ellbow joint). ECTP23 (P for propagating, expanding) shows us that the fracture could spread at the 23rd or 24th impulse.

Expanded Compression Test (ECT)

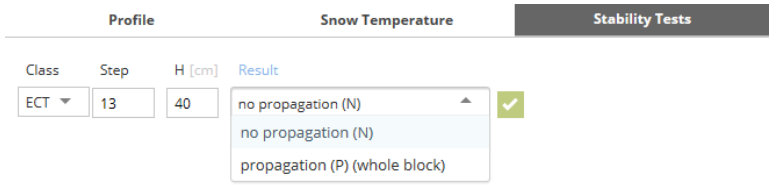
The ECT makes it possible to estimate the degree of fracture propagation inside the snowpack and thus, provides somewhat more information than the CT. For this, one removes a 90 x 30-cm large snow pillar. One places the blade of the shovel at its edge and in successive degrees, corresponding to the successive levels of weight/force of the CT, burdens it with a thrust. The entry of the ECT is much like that of the CT:

ECTP#@... **(Expanded Compression Test with propagation)**
Fracture spreads throughout the entire block upon strike no. # or the following strike; the strike # designated is the one at which the fracture occurs.

ECTN#@... **(Expanded Compression Test without propagation)**
Fracture occurs at strike no. # but does not spread even at the following strike. Fracture propagation could, yet need not necessarily, occur with additional strikes.

ECT31… Until the completion of the test, no fracture occurs.

In order to define whether it is an ECTP or an ECTN test, an appropriate selection must be entered in *Result*: either “sudden fracture” (P) or “partial fracture” (N).

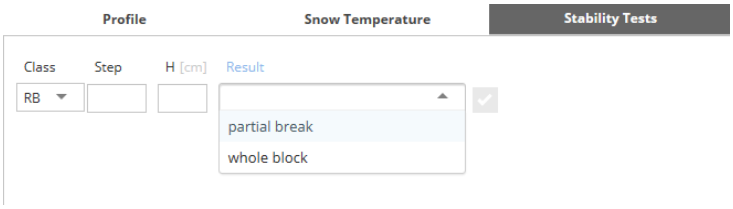


Rutschblocktest (RB)

The rutschblock test is the best, but also the most elaborate method to determine the stability of the snowpack. It is relatively easy to perform in practice, since it uses the body weight of the testing person to test the stability. For this, one removes a block 2 meters wide and 1.5 meters long (measured up the slope) from a slope which is relevant (about 35° gradient). Then the snow block is weighed upon in successive steps until it breaks:

RB 1@...	Fracture while digging or sawing (naturally)
RB 2@...	Fracture while gently bearing down on it with skis
RB 3@...	Fracture from 3 teeterings on it, standing on skis
RB 4@...	Fracture of upper third at first jump on it
RB 5@...	Fracture of upper third at 2nd or 3rd jump
RB 6@...	Fracture of upper third at jump without skis
RB 7	No fracture. Block remains stable.

if a fracture can be initiated, the snow profiler must record whether the entire block or only part of the block fractured.



Kleiner Blocktest (KB)

The “kleiner Blocktest (KB)” is primarily a simple method for weak layer diagnosis. By evaluating various factors, a statement about the snowpack stability can also be derived. The steepness of the slope does not play a role in the test, and the test can also be carried out in terrain with little slope. A block of 40 by 40 cm is shoveled or cut with a saw. It does not have to be exposed all the way down to the ground, that depends on the snowpack structure. However, it should be dug at least to a depth of one meter, as the load from a single skier will reach about that deep into the snowpack. By tapping sideways with the avalanche shovel from top to bottom with varying degrees of force, an attempt is made to find weak layers that can be separated. A distinction is made between light tapping (up to a maximum of 1 Nm), moderate tapping (about 2 Nm) and heavy tapping (more than 3 Nm). Start with light tapping and, if necessary, increase the impact hardness until breakage occurs or until layers separate from each other. A statement about the stability of the snowpack can be derived from the factors impact hardness, fracture area, depth of the weak layer, overlying layer, size of the crystals and thickness of the weak layer.

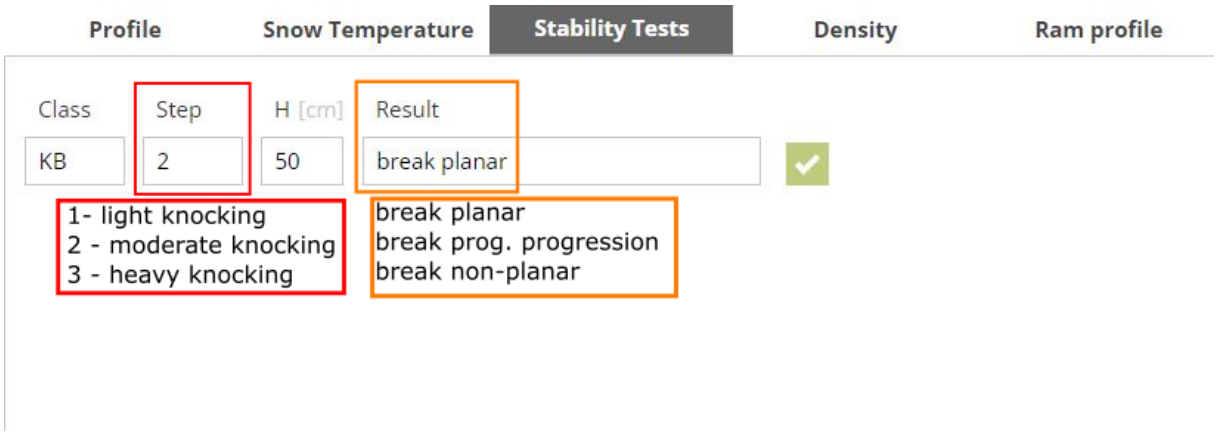
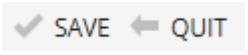
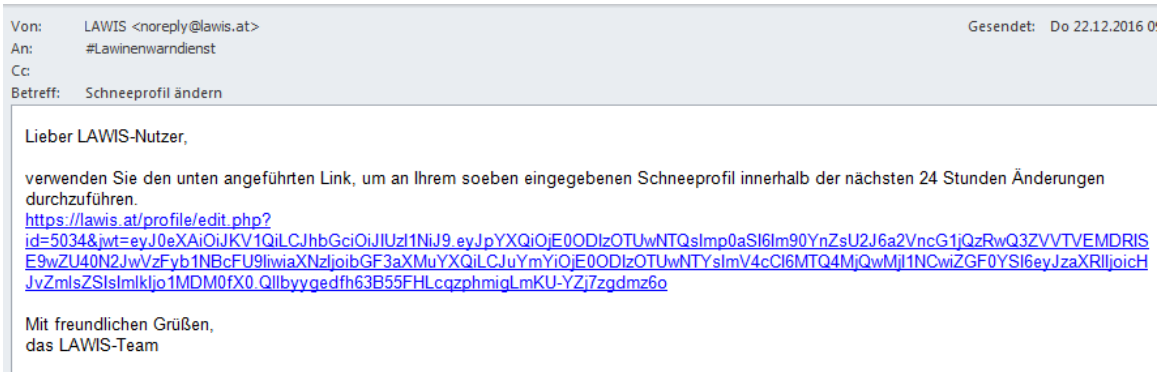


Fig: Input of the small block test. The impact hardness is specified in the Step field (1 - light knocking, 2 - moderate knocking, 3 - heavy knocking), the type of fracture surface (planar, prog. progression, non-planar) is defined via the Result field. Other factors related to the snowpack property (depth of the weak layer, overlying layer, size of the crystals, thickness of the weak layer) can be added via the text field (Remarks).

3.6. Changing entered profiles

The SAVE space is located at the upper right. 

By clicking on this space, your entire entry is uploaded and made visable and available to everyone. At the same time, you are sent an automatic email in which the link to making corrections to your entry is given to you. If you discover an error later, you can use this link to correct it within 24 hours of your entry. If you cannot or do not wish to make the correction yourself, please contact the LAWIS team by email or telephone.



Von: LAWIS <noreply@lawis.at> Gesendet: Do 22.12.2016 0
An: #Lawinenwarndienst
Cc:
Betreff: Schneeprofil ändern

Lieber LAWIS-Nutzer,

verwenden Sie den unten angeführten Link, um an Ihrem soeben eingegebenen Schneeprofil innerhalb der nächsten 24 Stunden Änderungen durchzuführen.
https://lawis.at/profile/edit.php?id=5034&jwt=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJpYXQiOjE0ODIzOTUwNTQsImp0aSI6Im90YnZsU2J6a2VncG1jQzRwQ3ZVVTVEMDRISE9wZU40N2JwVzFyb1NBcFU9liwiaXNzIjoibGF3aXMuYXQiLCJuYmYiOjE0ODIzOTUwNTYsImV4cCI6MTQ4MjQwMjI1NCwiZGF0YSI6eyJzaXRlIjoicHJvZmlsZSIsImlkIjo1MDM0fX0.QIlbyygedfh63B55FHLcqzphmigLmKU-YZj7zgdmz6o

Mit freundlichen Grüßen,
das LAWIS-Team

4. Often asked questions

When I was entering the coordinates and confirming them by pressing the ENTER key, the SnoProfiler crashed and all the data was lost. Why?

We are aware of this problem, which occurs in Internet Explorer 9. We recommend using a new browser version or installing / using a different web browser, e.g. Firefox, Chrome, Opera.

When I was entering the temperature, the value I entered was not accepted. Why?

The problem lies in temperatures with commas: unfortunately only dots are supported. If a comma occurs in the number, the value is not accepted.

I made an error when making an entry and only realized it later. Can I later correct my own profile?

No. Changing or deleting profiles can only be done by the administrator. If necessary, please send a message via email to lawine@tirol.gv.at.

When I was entering the snowpack hardness, my entry was not accepted. What am I doing wrong?

For entering snowpack hardness, certain rules were built into the system in order to circumvent errors. Thus, for layers with only round-shaped grains, a hardness of 1 or 1-2 is not possible. Another example: layers with only fresh fallen snow and/or fuzzy snow can only have a hardness of 1 or 2.

5. Printing information – Partners

Lawinenwarndienst Steiermark

LAWIS - Lawinenwarndienst Informationssystem

Created in collaboration with the Avalanche Warning Services of Tirol, Styria, Salzburg, Upper Austria, Vorarlberg, Carinthia, Lower Austria, together with the University of Vienna, Institute for Geography and Regional Research.