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Weisstannen–Elm

Crossing the Foopass

Rocks tell us the story of the mountains

The Glarus thrust as the major element of the UNESCO World Heritage site Tectonic Arena Sardona is almost visible from each point during the hike from Weisstannen to Elm.

The Foopass is an internationally reputed geological site since Arnold Escher and Albert Heim proposed the Glarus double fold at this place. The story of this theory shows us that geology is a very animated science.

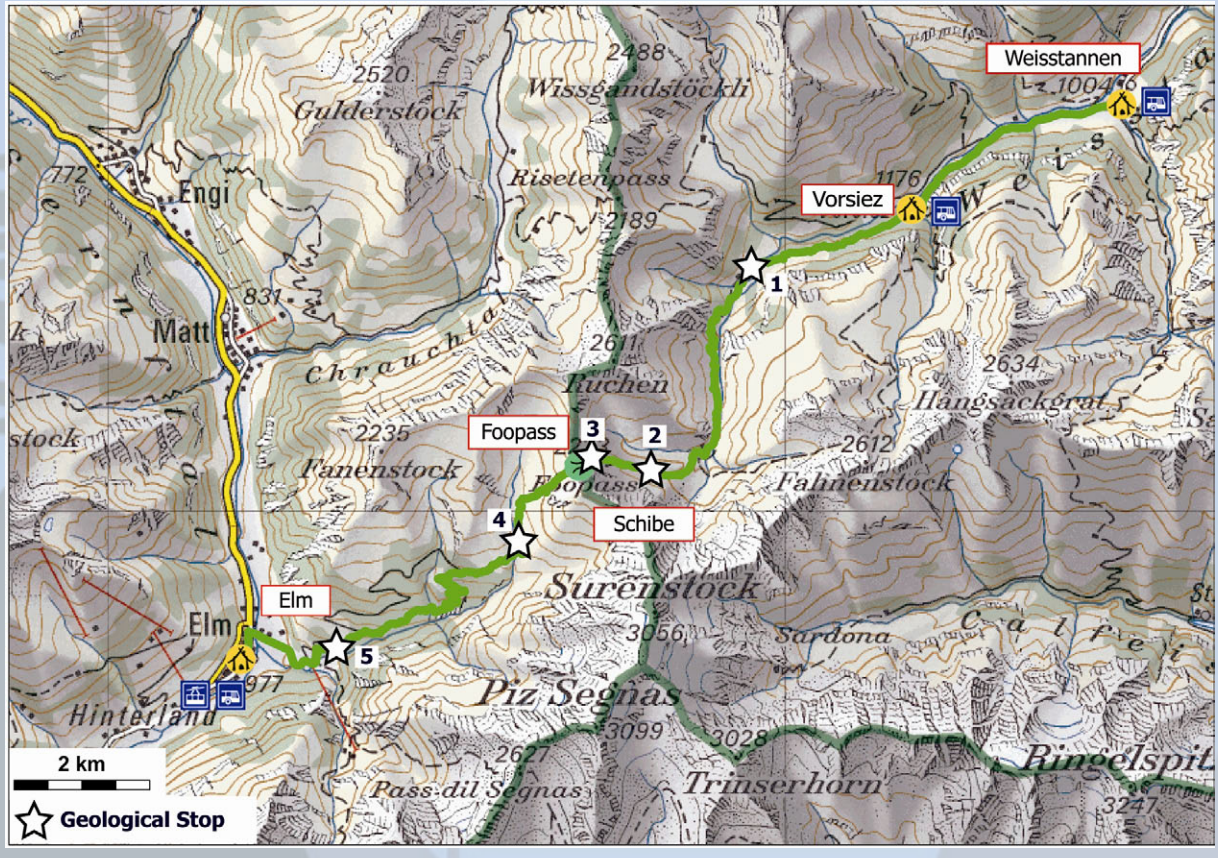
planetearth® Earth Sciences for Society Via GeoAlpina
An International Year of Planet Earth project to make the alpine geological heritage known and accessible

Via Alpina Discover the Alps!

IUGS International Union of Geological Sciences

Weisstannen – Walabütz – Foostock – Foopass – Elm

Location :	*Weisstannental, Raminer Tal, Switzerland*
	Green Path of ViaAlpina
Stage :	*C3 (partially; from Weisstannen)*
Beginning :	*Weisstannen (– recommended Vorsiez)*
Destination :	*Elm*
Access :	*Sargans (by train from Zürich or Chur) –> Weisstannen / Vorsiez (by bus)*
Maps :	*swisstopo 247T Sardona 1:50'000, Geological Map of Glaris 1:50'000 (Sheet 117), Geological map of Switzerland 1:500'000*
Minimum elevation :	*956 m (Elm)*
Maximum elevation :	*2225 m (Foopass)*
Maximum ascent :	*1459 m (1242 m from Vorsiez)*
Maximum descent :	*1498 m (1470 m)*
Total time :	*7h 50min (6h 50min)*
Distance :	*21.4 km (17.8 km)*
Difficulty :	*T3 ambitious mountain hiking (Foopass E and W)*



Geology between Walabütz (Stop 1) and Elm (Stop 5)

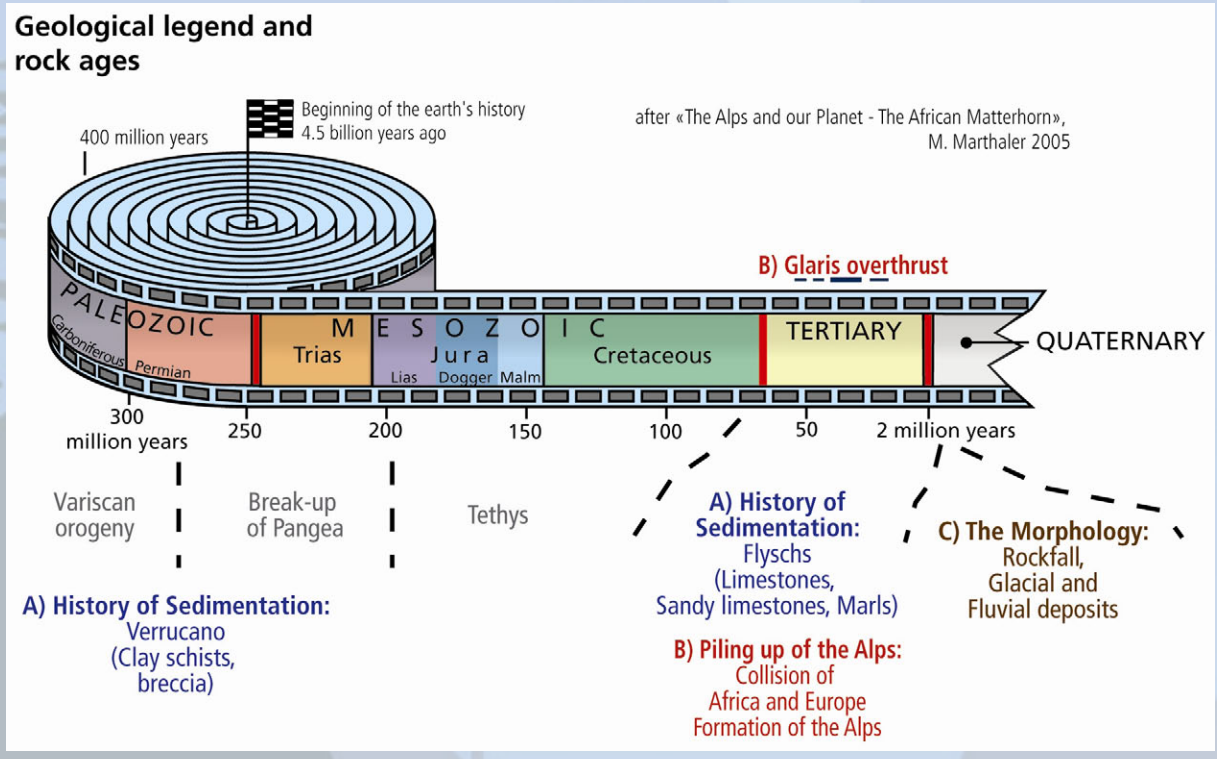
1. **Geological setting:** *Formation of Verrucano rocks during the Permian in a dessert-like basin of the super continent Pangaea and of Flysch rocks during the late Cretaceous and the Tertiary at the former European continental margin of the Tethys Ocean. The tectonic setting is characterized by the Glarus thrust and a lot of folds.*

2. **Simplified geological history:** (bold text corresponds to the most important steps):

   A)The History of Sedimentation during two different time periods (Verrucano during Permian and Flysch during Cretaceous / Tertiary) and in two different paleogeographic realms..

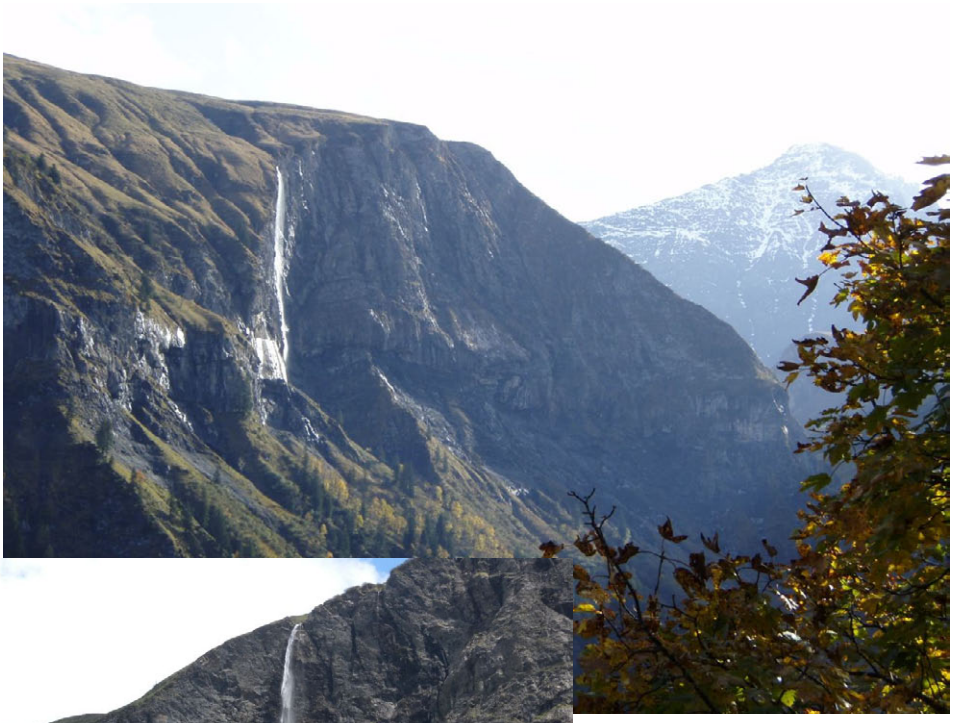
   *B) Vestiges of the **Piling up of the Alps** (Glarus thrust and other thrusts and folds) indicate the compression and the deformation of the European Plate packed under the African Plate.*

   *C) A **Morphology** designed by ice and water with vestiges of alteration (scree slopes), landslides, glaciers and debris fans.*



Stop 1: Walabütz – Foowäldli (1361 m)

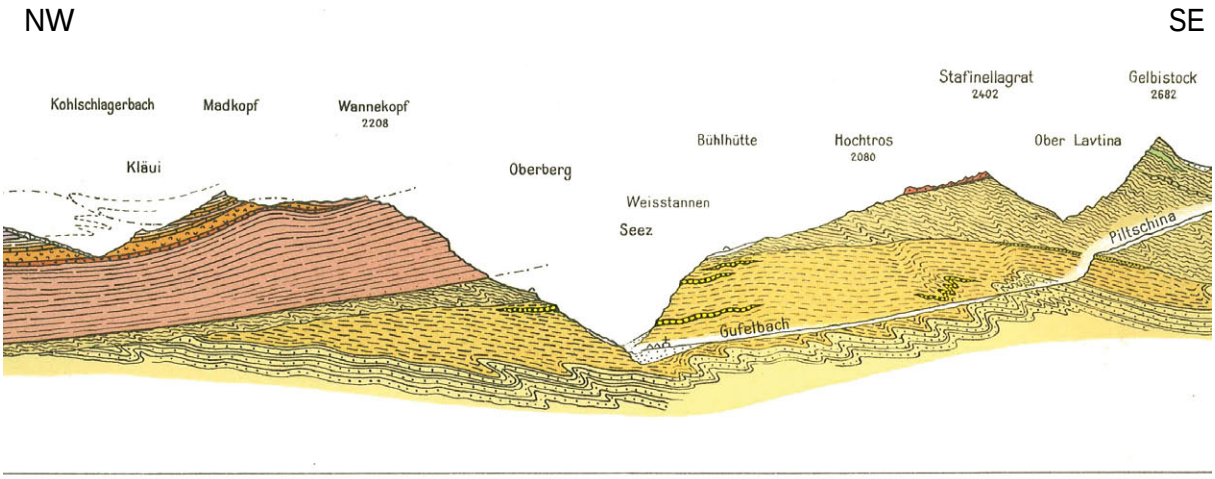
The best observation points for the cascades are between the alpine cottages of Walabütz Untersäss and the water cistern of Walabütz.

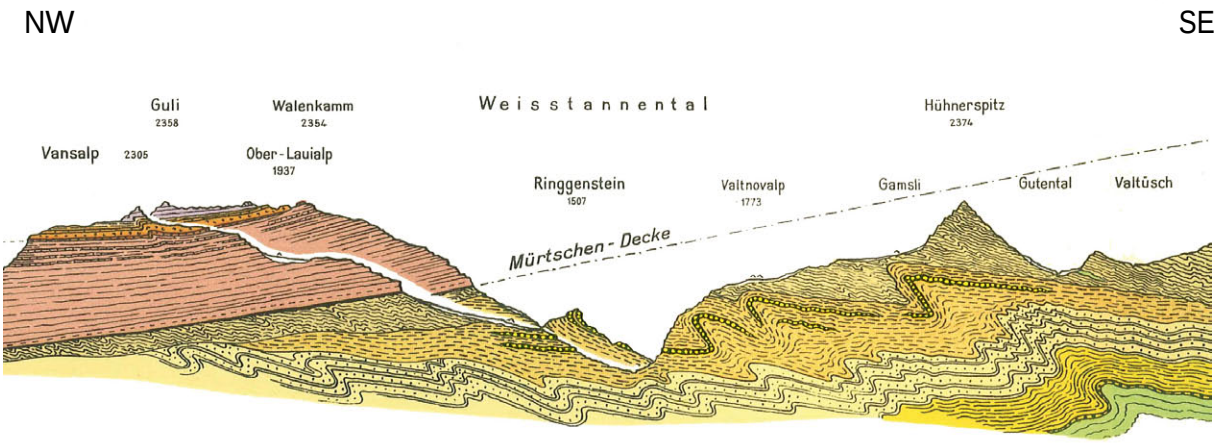


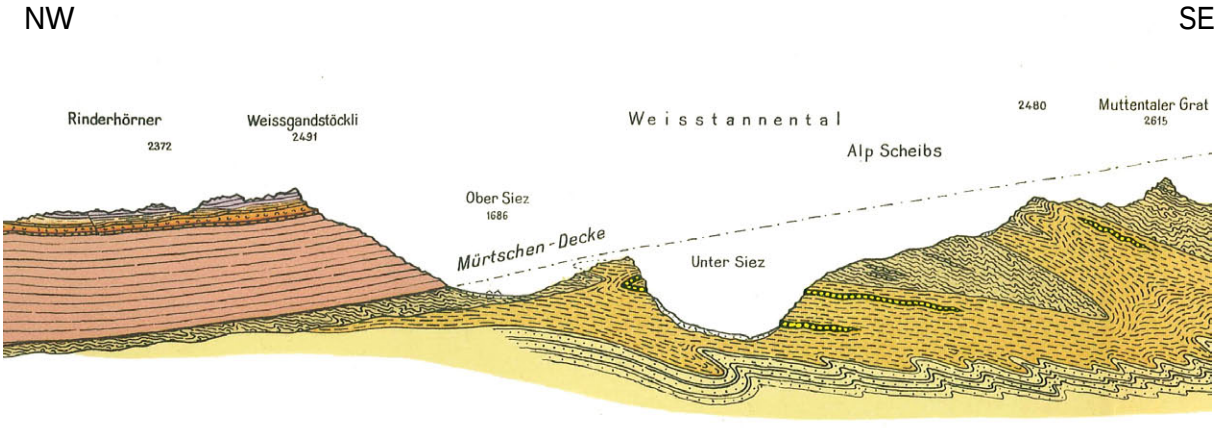
The southern Weisstannental shows outcrops of Flysch (grey-brown limestones, marls and shales). Schuppen tectonics and intensive folded areas have strongly deformed these rocks during orogenesis. Therefore, distinct levels cannot be compared or correlated on both sides of the valley.

The only marker, that can be clearly distinguished on the rock faces, is the massive Nummulite limestone («N»), also folded in a large scale and with a thickness up to 20 m.

Especially in spring the cascades of the Mattbach (Mattbachfall) and the Scheuersbach (Isengrindfall) falling down these rock faces are impressive. The Isengrindfall has a drop height of 230 m!







The Glarus thrust can be located in the upper part of the Weisstannental. The Flysch rocks just below the overthrust are 35 to 50 ma old. They are mainly composed of grey-brown limestones, marls and slates. Schuppen tectonics and intensive folded areas have strongly deformed these rocks during orogenesis. Therefore, distinct levels cannot be compared or correlated on both sides of the valley.

The Nummulite limestone can be identified as a black ribbon with yellow points.

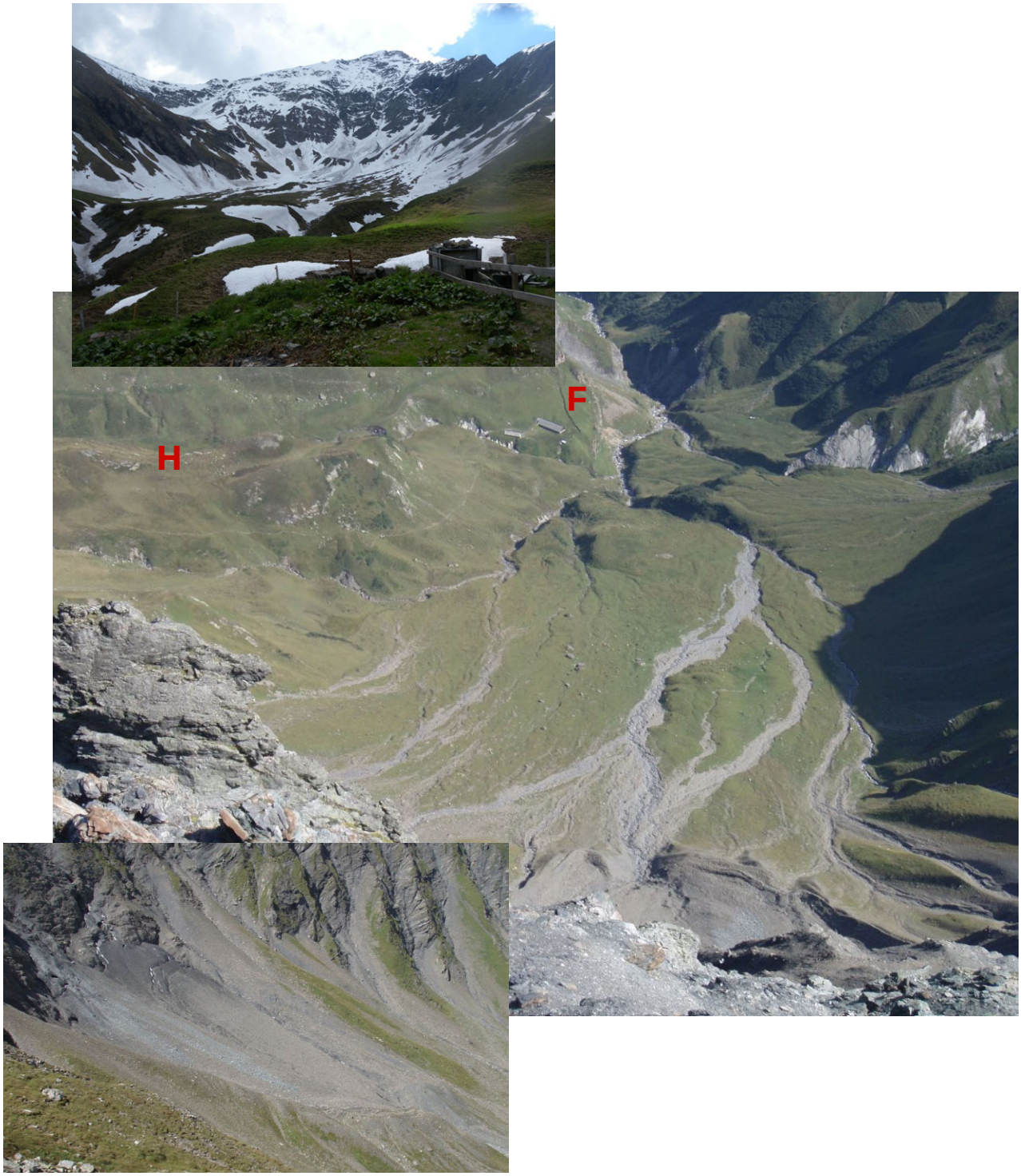
These blocks of Nummulite limestone at the water cistern of the Seetz at Walabütz Untersäss are not the result of a single gigantic landslide but indicate several smaller ones.

Lenticular Nummulites (fossils with a size of max. 2 cm) can frequently be identified in the blocs.

Downwards, the glacier shaped morphology of the valley can be easily recognized.

Stop 2: Alpine cottages on the Fooalp (1875 m): The Basin of Foo Rossalphüttli (2071 m): Foostock Southern rock side

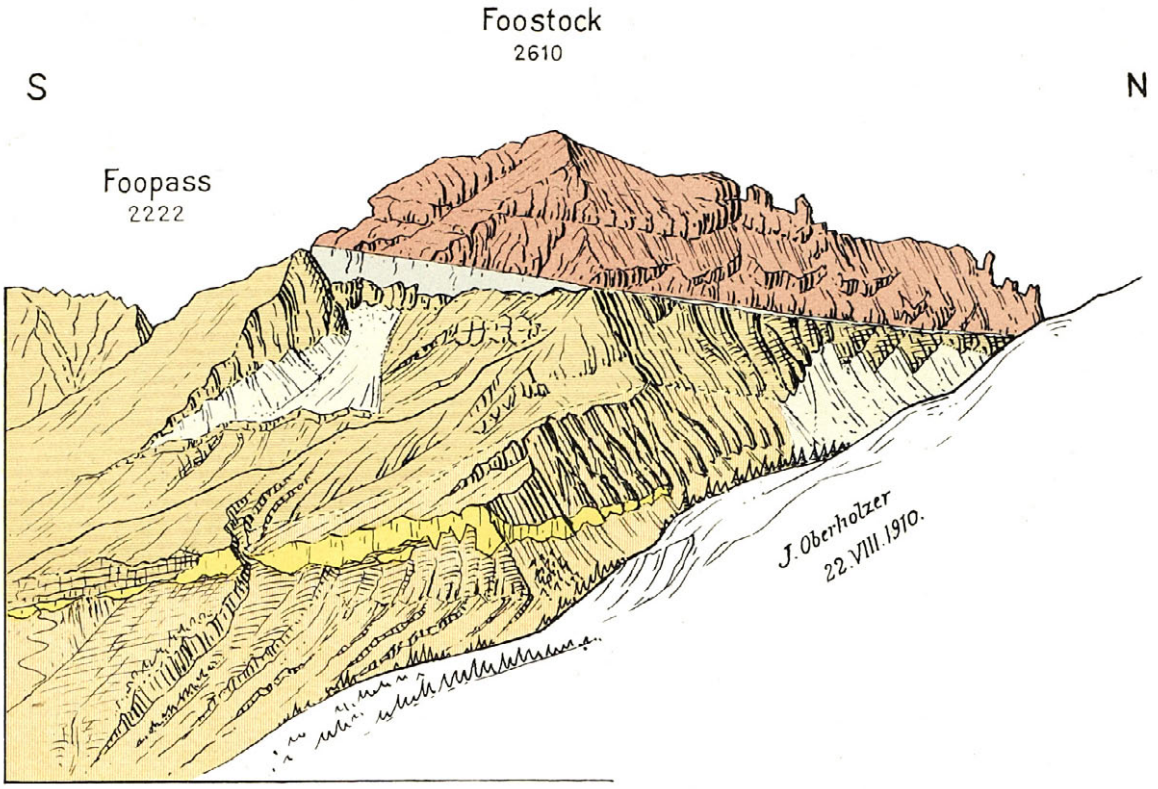
From Fooalp («F»), the Via GeoAlpina continues to Heitelchöpf («H»). The best observation points for the structures on the Southern rock face of the Foostock are between Heitelchöpf and Foopass.

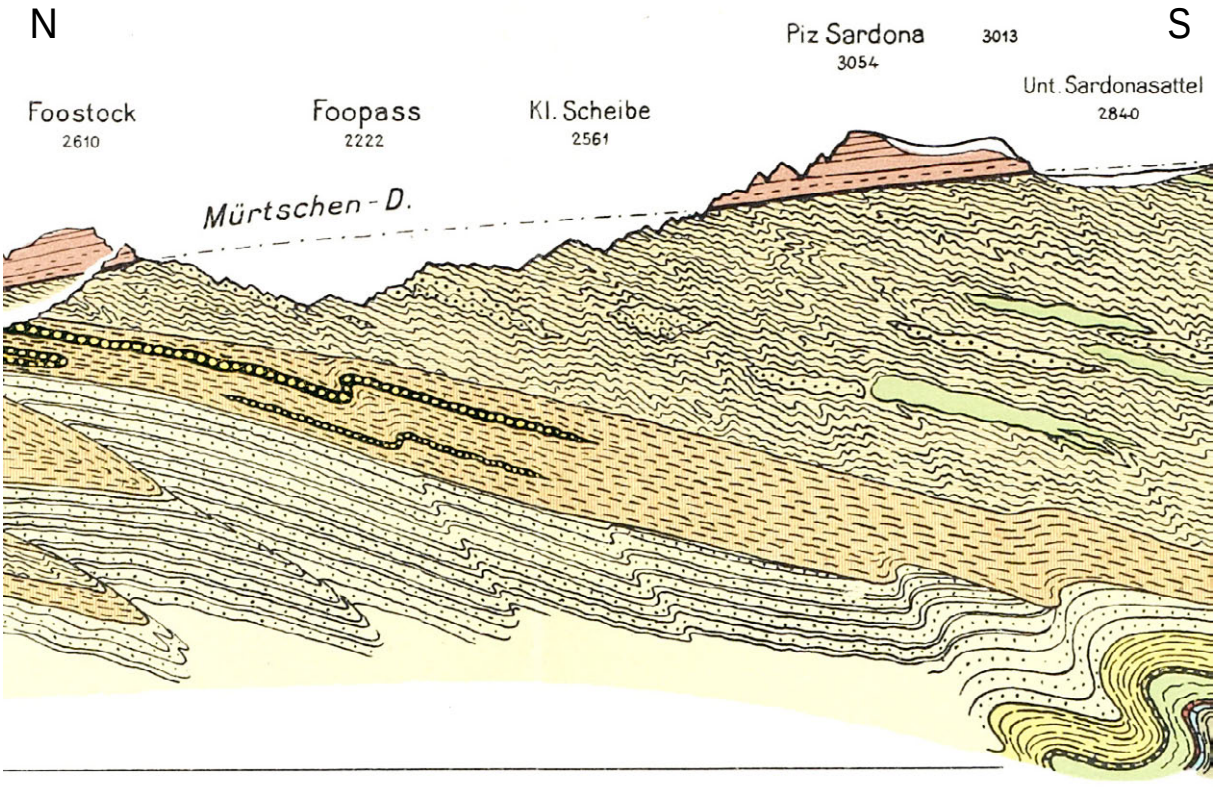


After the cuesta with the Nummulite limestone, the alpine cottages of Foo are reached.

The basin of Foo is a beautiful alluvial plain with nice sedimentary structures and it hosts the spring of the Seez.

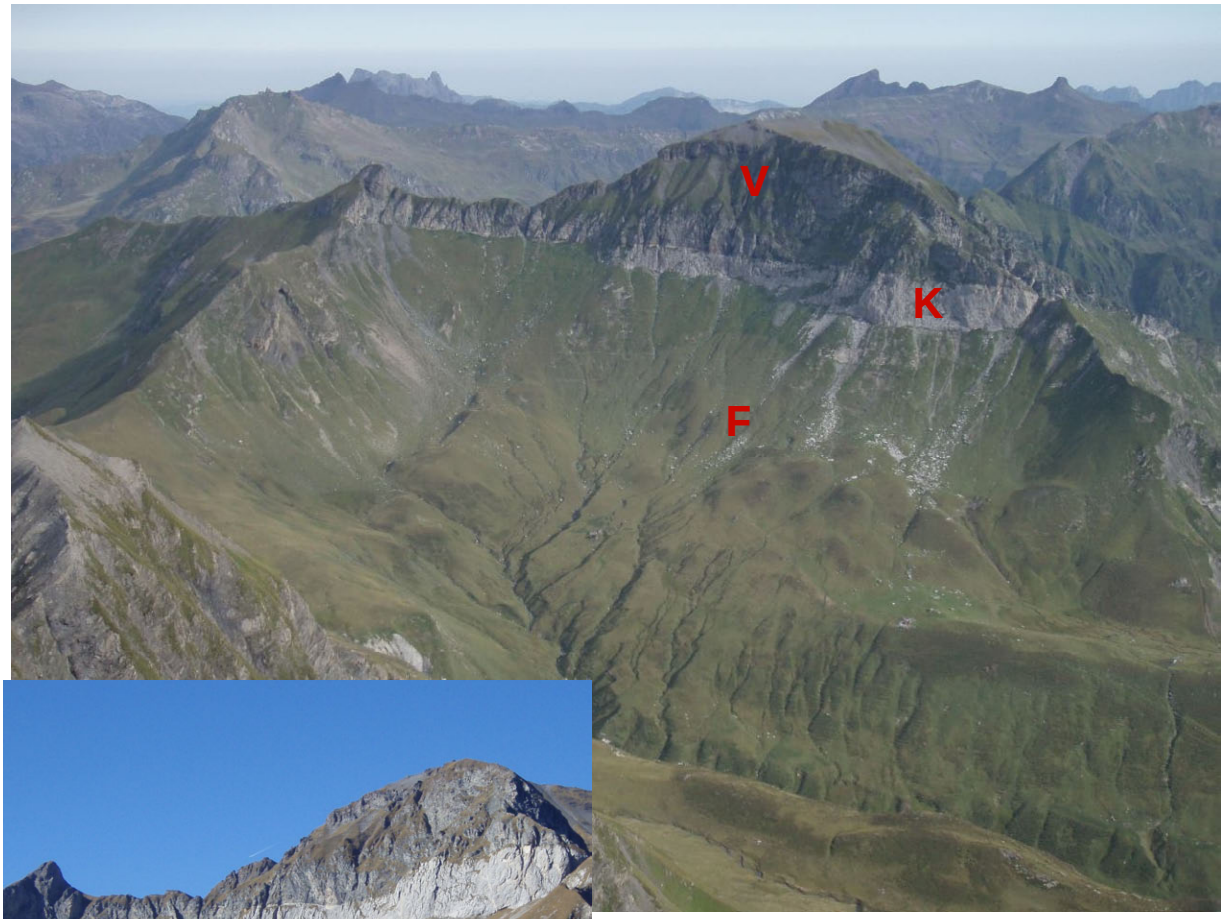
Moraines indicate the last glaciations at the bottom of the Gross Schibä.

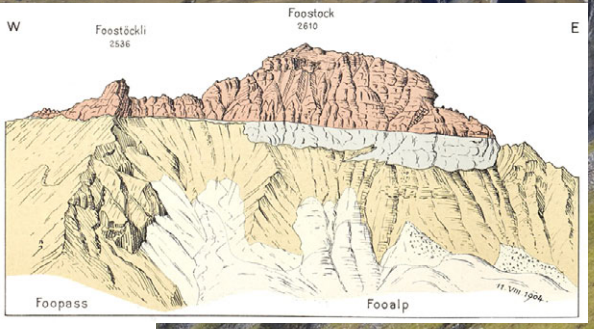




At the Foostock, a level of limestones (100–150 ma) can be distinguished between the overlaying reddish Verrucano (250–350 ma) of the summit and the downwards yellowish Flysch (35–50 ma).

These outcrops can be followed on the way to the Foopass at the Gross Schibä and the Piz Sardona in the South, but also on the Southern face of the Foostock in the North (see next page).



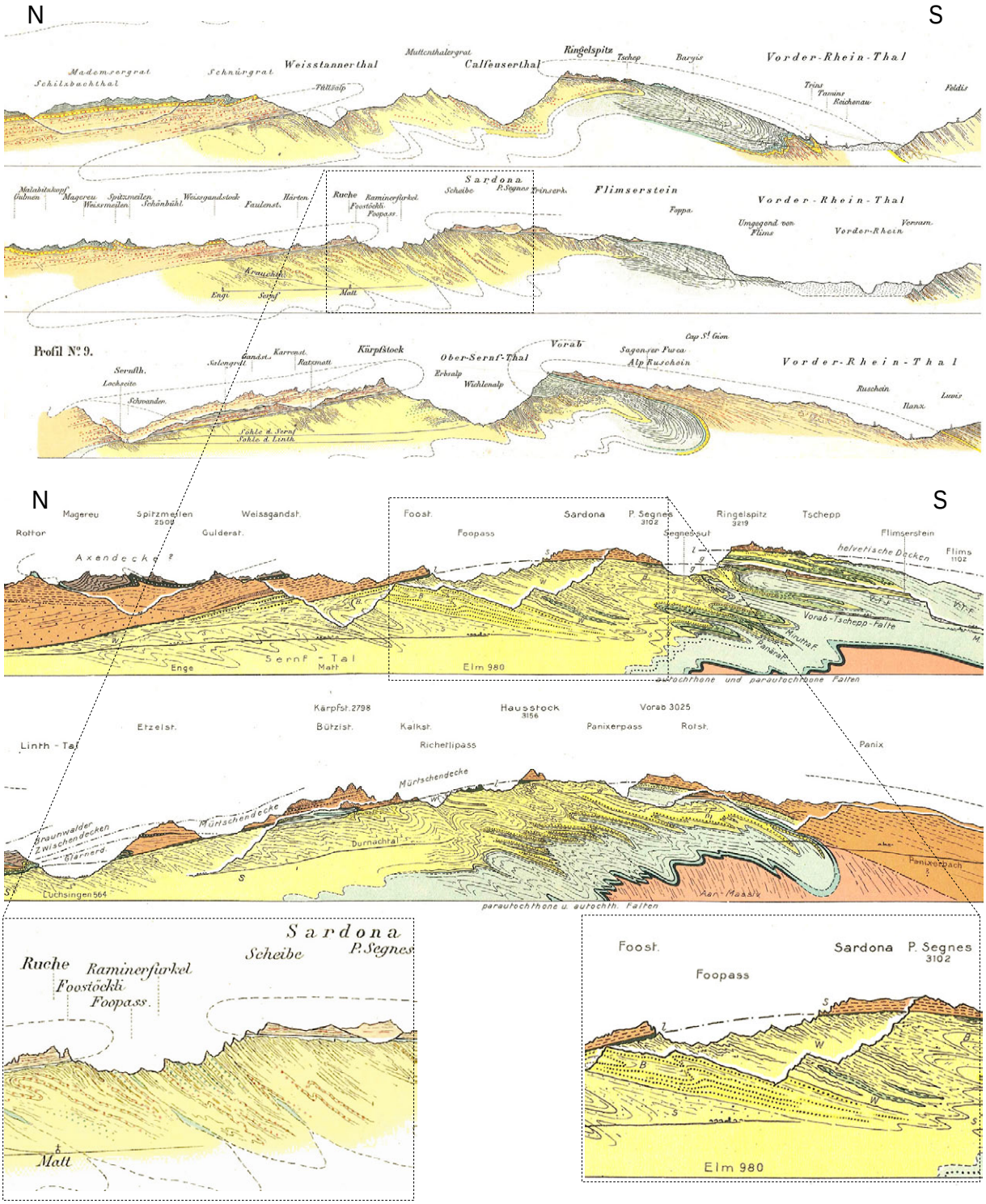


At this place, the structures of the Glarus thrust («T») are particularly impressive. Therefore, a lot of international geological excursions come to this area.

Between the 250–300ma old reddish Verrucano of the Foostock summit («V») and the 35–50 ma old yellowish Flysch of the Fooalp («F») lies a block of 100–150 ma old grey limestones («K»).

Stop 3: Foopass (2223 m)

A short walk from the Foopass on the ridge path towards the North to Point 2261 offers the best view.



Alteration processes divided the Glarus thrust at the Foopass. This led Arnold Escher in the mid-19th century to propose the Glarus double fold at this location. This controversial idea made the Foopass a major attraction for geologists.

Albert Heim published in 1878 his interpretation of the Foopass with the double fold of Glarus as illustrated in the first three sections and above this paragraph at the left. Note the impressive details in the sections of Heim!

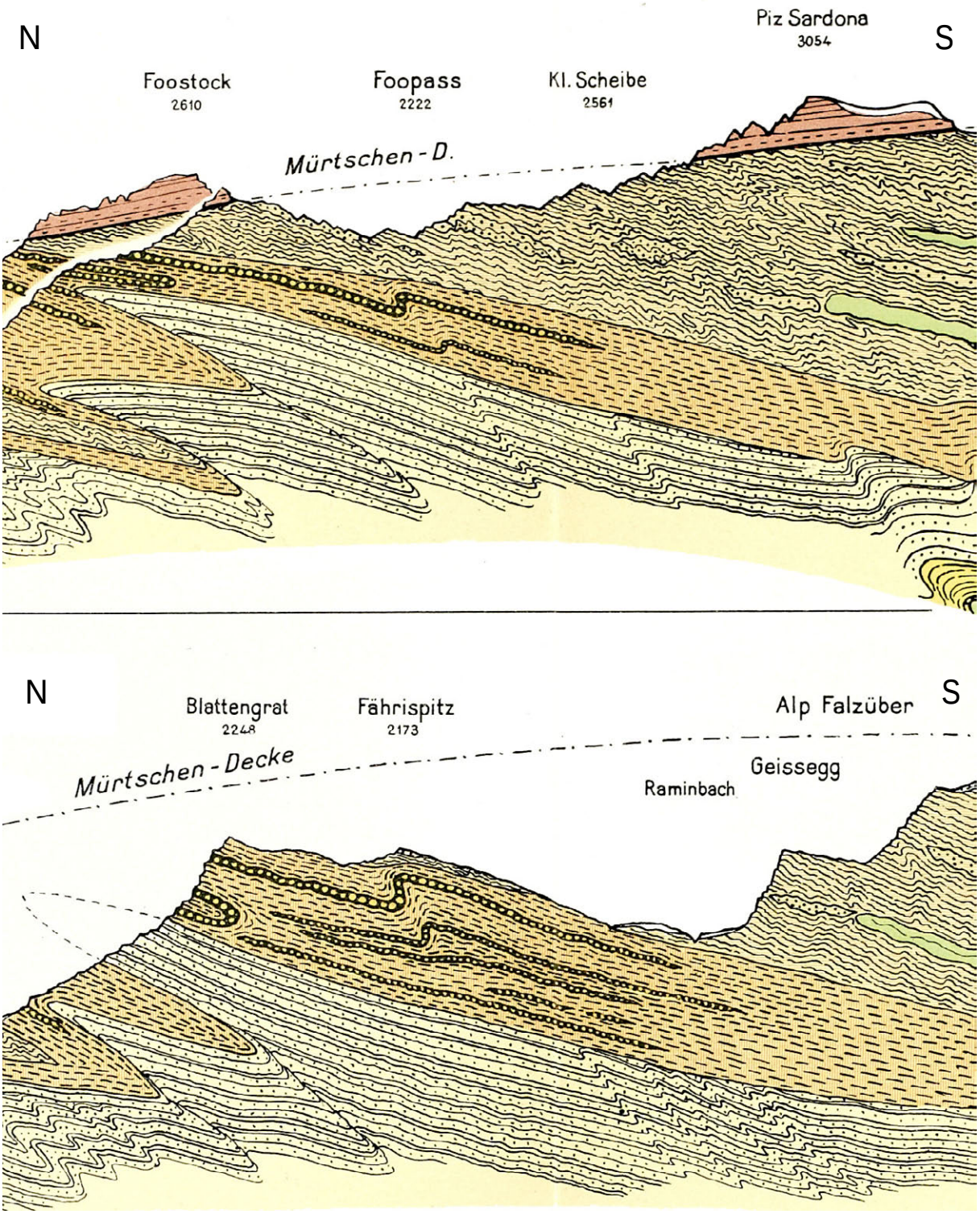
The fourth section and the on just right above this paragraph are taken from a publication of Heim in 1921, when he interpreted the geological situation with only one large northwards oriented overthrust.

There is no evidence for Verrucano rocks at the Foopass. Therefore Escher and Heim proposed the double fold of Glarus at this place. They thought that tectonics associated with the double fold made Verrucano rocks less resistant and therefore easier to erode.

View from the Foopass in direction of Alp Ramin with its typical Flysch morphology.

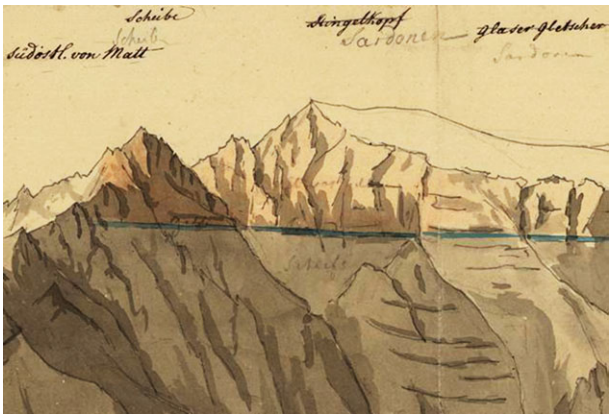
Stop 4: Alp Ramin (1897 m): Sardona–Segnes Group

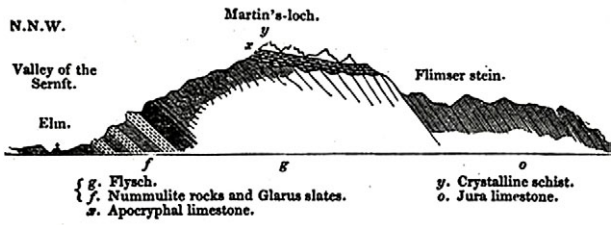
Nice viewpoints on the Sardona–Segnes Group between Raminer Matt and Mittler Stafel.



Section of Jakob Oberholzer between Piz Sardona and the Foostock published in 1933.

Above: The Glarus thrust is more or less horizontal in the region of the Tschingelhörner. The dipping is already clearly northwards in the region of the Foopass.
Below: Between Alp Ramin and Blattengrat, the Verrucano is eroded away already.



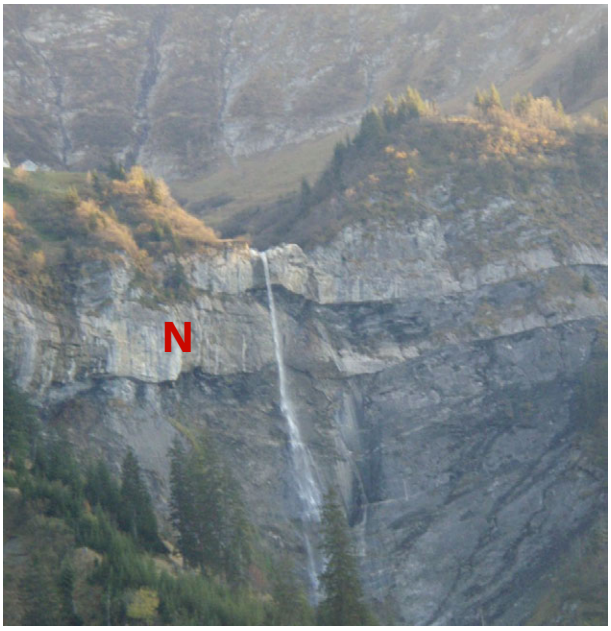


On top: The Glarus thrust is very well visible at the Sardona–Segnes group, which provided its name to the UNESCO World Heritage site Tectonic Arena Sardona. In this area, the Verrucano rocks lay directly on much younger Flysch rocks..

Lower left: Water colour of the Sardona Group from Arnold Escher (1845) and
Lower right: section of the Tschingelhörner of the Scotish geologist Sir Impey Murchinson (1849), who visited the Glarus thrust on the invitation of Escher. He was the first to publish the idea of a «one enormous overthrust».

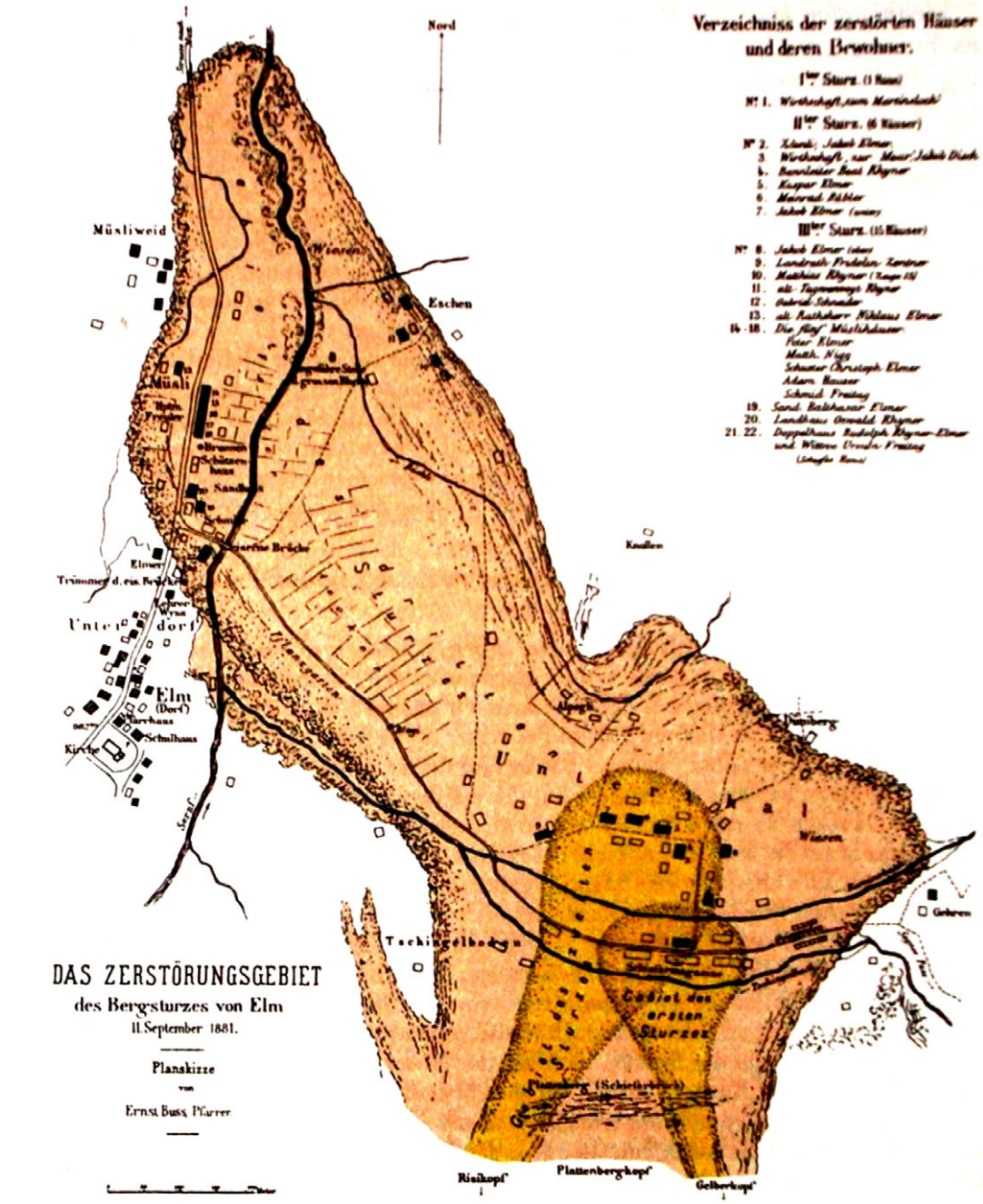
Stop 5: Landslide Elm, Elm (980 m)

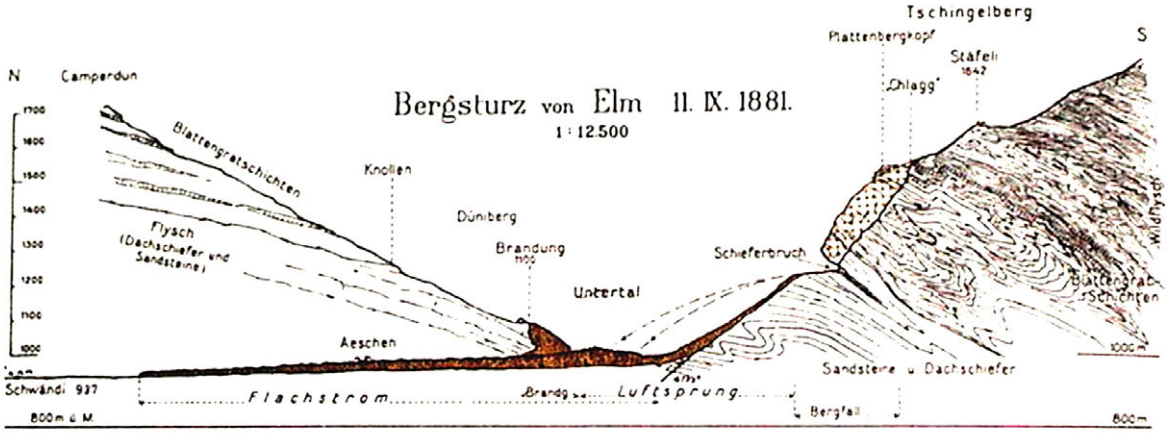
The site of a terrible catastrophe.



On the descent from the Alp Ramin to Elm, a cascade can be seen on the opposite side of the valley just below the Alp Falzüber. It fells over the clear, massive Nummulite limestone rock face («N»).

The Tschingelhörner and the Martinsloch can only be observed in the village of Elm.





Map of Elm with the debris avalanche of the main land slide (orange) and the two preceding small rock fall events (yellow). The debris flow ended up 100 m upward the valley slopes on the opposite side. Then, it was deviated towards Northwest running down almost 1.5 km down the valley before it finally stopped.

This unusual long mass flow of a landslide is nowadays explained by air captured under the rock masses, which were gliding like an air cushion.

From: Buss & Heim, 1881.






One of the most catastrophic landslides of the Swiss history occurred In the evening of September 11th 1881. It was a Sunday, when more 10–11 million tons of rocks fell from the Tschingelhörner and buried a part of the village and killed 114 people. 83 houses and stables were destroyed and 90 hectares of agricultural surface lost.

The landslide was caused by the exploitation of slates, which offered at that time work to most of the people in Elm. This exploitation of the slate was done improperly. No protective pillows were left over and no further protection measures had been undertaken. The rock side was mined as deep as 65 m on a length of more than 180 m. Therefore, the rock face had become unstable. Already 5 years before the landslide took place, a fissure opened in the quarry. Just a couple of days before the landslide, several smaller rock fall events took place. Intense rains increased the danger and one day before the event, a group of experts composed of councillors and forest officials didn't realize the danger.

The following day the first rock fall events took place in the Western and Eastern part of the endangered area and buried some houses. As a consequence, once the stabilizing sides of the rock face had gone, the mined part of the quarry area fell down some 20 minutes later. The rock masses rushed down more than 300 m in a free fall velocity to the bottom of the Plattenberg, where they bounced and continued as a dark rock- and dust-landslide.

The region of Elm still bears traces of this event (i.e. blocks and a woodless rock face; bottom right).

For further information's ...

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Where no other reference given the hand drawn panoramas and profiles are taken from J. Oberholzer (1933) and the photos were made by D. Imper.

Practical information

Cottages and guesthouses

In the Weisstannental at Weisstannen, on the alps of Vorsiez and Walabütz and in Elm.

Tourism : Elm Tourismus
Tel : +41 (0)55 642 52 52 http://www.elm.ch

Tourism : Mels Tourismus http://www.mels.ch

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