

32nd IGC Conference 2011

Guide for the Pre-Conference Excursion

12 – 13 July 2011

Bern – Emmental – Erstfeld – San Gottardo – **Campolungo** – Susten - Interlaken



Marble outcrop at Campolungo, Ticino, southern Switzerland with pink sapphire specimen from Campolungo.

© original photos from Sarah Huber (background) and Olivier Roth (ruby from ETH collection).

Programme:

Tuesday 12th July 2011:

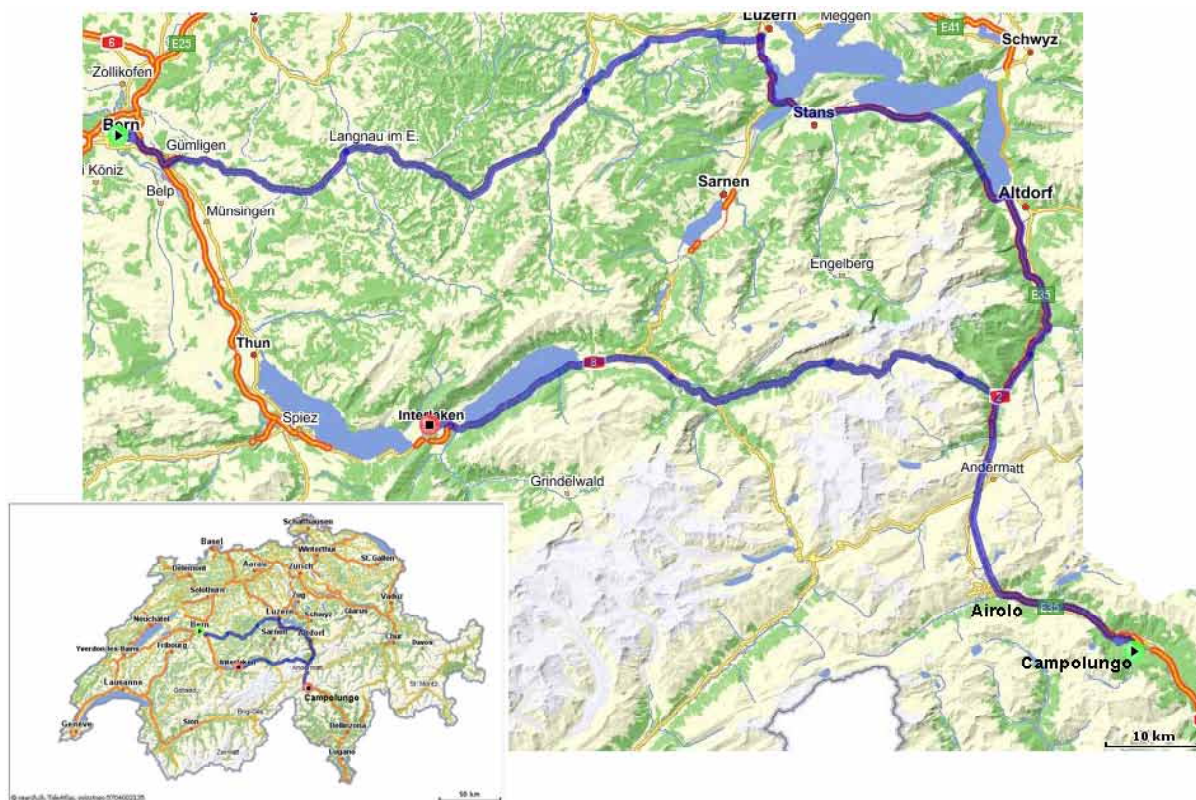
- The mineralogical collection at the Natural History Museum in Bern
- The Emmental, a traditional Swiss country side
- Gotthard base tunnel, the world's longest rail tunnel (Visitor Centre Erstfeld)
- Gotthard Pass, a historic crossing in the centre of the Alps

Hotel in Airolo (Canton of Ticino), southern Switzerland

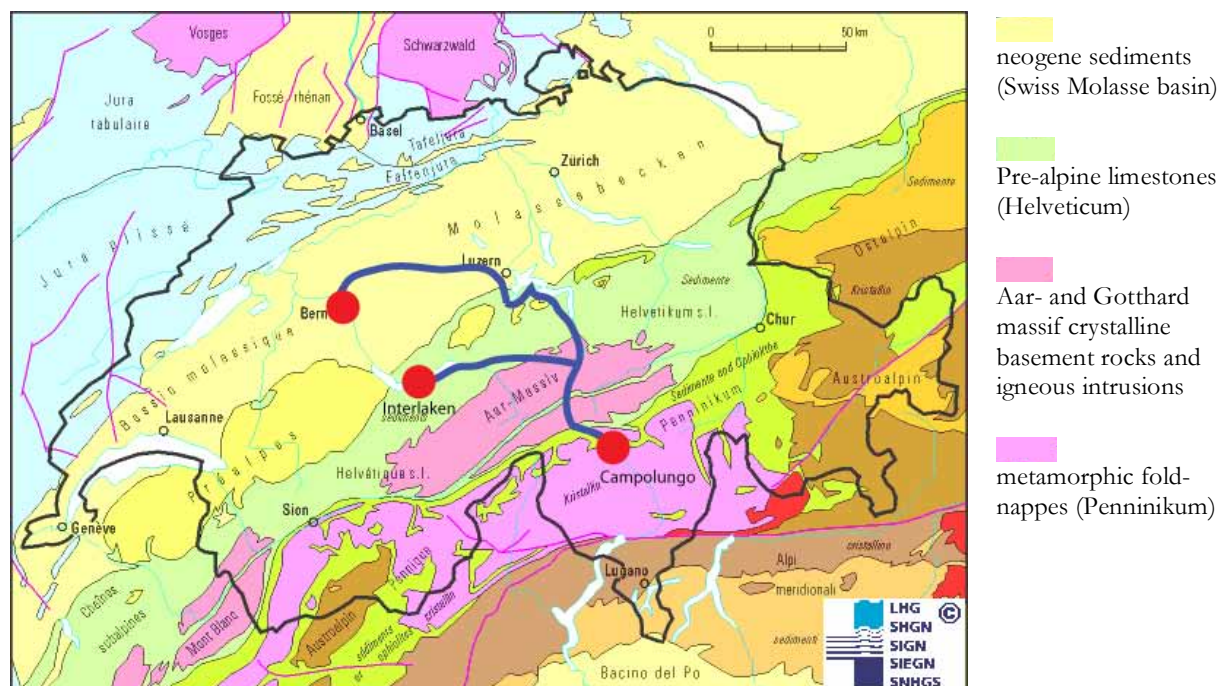
Wednesday 13th July 2011:

- Mineral deposit at Campolungo (Ticino) southern Switzerland
- Sustenpass
- Interlaken

The maps:



Geological overview:



© Swiss geological survey

During this field trip, we will cross several geological units, actually along increasing metamorphic grades: from diagenesis in the Emmental up to amphibolite facies metamorphism in southern Switzerland (Campolungo).

Geologically, we are starting from relatively young Neogene sediments (< 30 ma) in Bern and the Emmental (mostly conglomerates), often superposed by Quaternary sediments. From Lucerne to approximately Erstfeld we are in deformed Pre-alpine limestones and clays (so-called “Helveticum”) which were deposited in a shallow marine basin in Mesozoic times (235-65 ma). Towards the Gotthardpass we are crossing the granitic rocks of the Aar- and Gotthard massif and adjacent granitoid rocks, resulting from various igneous intrusions from Ordovician (about 470 ma) to the Hercynian orogeny (305-290 ma). These rocks are thus much older than the Tertiary Alpine orogeny (mostly Oligocene to Miocene 40 ma – 15 ma) and were generally only passively involved in this late orogenetic cycle.

At Alpe Campolungo, we are in the so-called Penninic fold-nappes, which represent heavily deformed and metamorphosed pre-Alpine magmatic rocks (Paleozoic and Precambrian) together with their Mesozoic para-autochthonous sediment cover. They were overthrust, folded and piled up as fold-nappes during the Alpine orogeny.

Finally arriving in Interlaken we are back in the pre-Alpine limestones and clays (Helveticum).

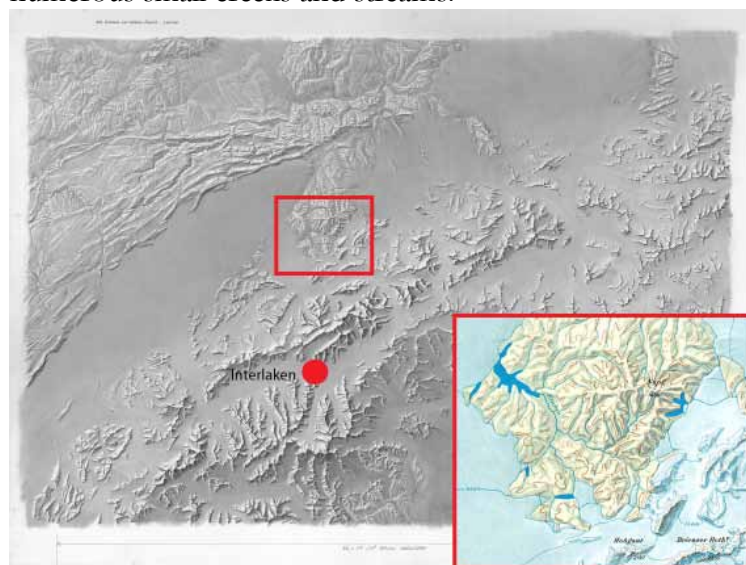


Emmental:



Typical view in the Emmental region, near Truebschachen. © M.S. Krzemnicki

The Emmental (Emmen valley) is located in the centre of Switzerland, between Berne, Lucerne and Langenthal. The Emmental and the adjacent Napf region (UNESCO World heritage) are dominated by rolling hills, covered by farmland and forest. In the valleys we find small villages whereas on the smooth slopes of the hills there are many old farmhouses, built in the traditional style of the region. The shape of the landscape with its harmonic pattern of hills and widely ramified valleys is due to the fact, that this part of Switzerland was not shaped by large glaciers, which covered most of Switzerland during the last Ice ages, but only shaped by numerous small creeks and streams.



© H. Leuzinger. „Die Schweiz zur letzten Eiszeit". Sheet 6 of the Atlas of Switzerland. (section) by H. Leuzinger and E. Imhof 1970. Available from swisstopo (©) 1:550,000.



The restaurant Bären, a traditional building in Lagnau (Emmental) and “Meringues” at their best! © M.S. Krzemnicki

The Emmental, literally the valley of the river Emme, is a rural region with plenty of nice settings and hideaways, and has preserved much of its historic charm up to nowadays. For Swiss citizens, the Emmental is famous for its local cheese containing lots of large bubbles and sweet pastries (especially the so-called “Meringues”).



It was also the home of Jeremias Gotthelf, a catholic priest and writer (1797-1854), who had written a number of books and dramas about local life which still nowadays are very popular.

Jeremias Gotthelf and one of his books: “the black spider”.

Geologically, the Emmental is mainly formed by conglomerates (so-called “Nagelfluh”), which were sedimented during and shortly after the Alpine orogeny (approx. 35-15 ma). Late-stage Alpine compression resulted in slight deformations of the conglomerates. The rounded pebbles found in this conglomerate are originating from various rocks. They were eroded from their original lithologies in the lifting Alps and transported by rivers into large alluvial fans developing in a series of freshwater and saltwater basins over the times. In these alluvial fans the rounded pebbles were cemented thus forming conglomerates. The “Nagelfluh”-conglomerate has a very colourful and inhomogeneous appearance due to the variability of its pebbles originating from different original lithologies.



Nagelfluh conglomerate near Langnau in the Emmental. © M.S. Krzemnicki

Apart from this, the conglomerates of the Emmental and Napf region also contain some gold. This gold originally stems from primary gold mineralisations in alpine rocks, which have eroded long time ago. Although no economic gold production is feasible, there are many hobbyists who wash the fine gold flakes out of the stream gravels in that area.



Tiny gold flakes from the Emmental region. © H. Becherer



Erstfeld (rail tunnel visitor centre) and Gotthard Pass:



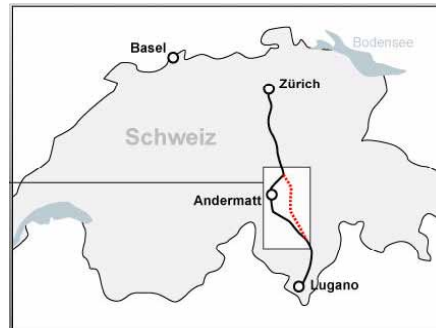
The entrance of the Gotthard rail tunnel in Erstfeld. © Gaetan Bally, Associated Press



Since ancient times, the Gotthard Pass has been a major crossing link between North- and South-Europe. With beginning of industrialisation, a first rail tunnel (15 km long) across the Gotthard massif was planned and finally built in 1872-1879.

With the increase in traffic and cargo in recent years, the Swiss government and tax payers decided to build a new rail tunnel, as part of the new transalpine European rail route. With a length of 57 km, the world's longest tunnel should become operational at the end of 2016. This pioneering achievement of the 21st century will bring major improvements to travel and transportation systems in the heart of Europe.

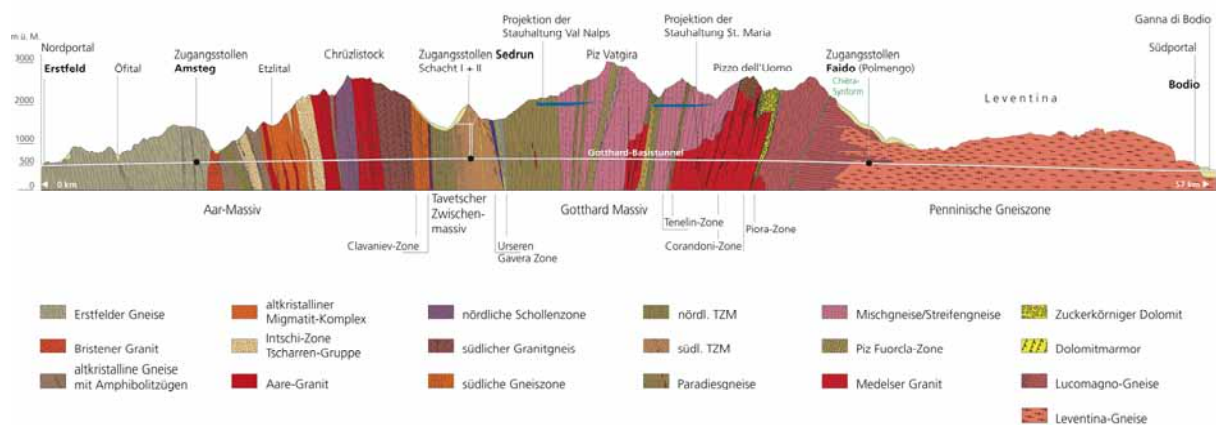
The old Gotthard mail coach. Painting by R. Koller 1873.



The new rail tunnel is 57 km long with the tunnel entries at Erstfeld (North) and Bodio (South). It will be crossing different lithologies, from hard granitic rocks to strongly deformed and fractured metasediments, which make tunnel drilling a challenge.

Gotthard-Basistunnel

Geologisches Längenprofil



Section along the new Gotthard rail tunnel, showing the main lithologies. The max altitude of the train tracks is only 550 m, the altitude of Bern. This will permit high speeds up to 250 km/h for passenger trains. The max overlay of alpine rocks is approximately 2350 m (underneath Piz Vagira). © AlpTransit Gotthard AG



Diamonds are currently found in some quantities in the Gotthard massif, however, unfortunately only at the head of the tunnel boring machines.

The Gotthard region is well known for spectacular mineral specimens. Many zones rich in minerals are documented, including specimens, which were found during the tunnel drillings through the Gotthard massif.

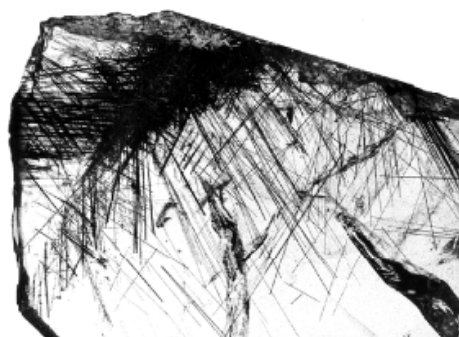
An outstanding example is the finding of the giant quartz crystals from “Planggenstock” at Göscheneralp in the year 2006. These crystals are nowadays at display in the Natural History Museum in Bern. Many other findings especially at Göscheneralp and Fibbia (close to the Gotthard pass) have made this region well known for mineral collectors.



Large pink fluorite (10 cm) and giant quartz group (length 1 m) from Planggenstock. © Olivier Roth 2007



Hematite aggregate („Iron rose“) from the Gotthard region (Fibbia) and brookite from Chärstelenbach near Bristen. © Thomas Schüpbach, collection Peter Amacher.



Rock crystal with rutile inclusions. © GeoDZ.com Faceted smoky quartz from Gotthard. © www.pierre-a-facettes.ch



Campolungo:

The Campolungo is located in the Canton of Ticino in the Italian speaking southern part of the Swiss Alps close to the villages Airolo and Faido. Literally, Campolungo means the “long field”, and it is actually a small high plateau in the midst of the rugged Alps in Ticino.

The marble outcrop at Campolungo is famous with Alpine mineralogists, as it is one of the few places in the Alps where specimens of corundum, diaspore, tourmaline, and beautiful tremolites are found.

Campolungo with Pizzo del Prèvat in the background, and the impressive folded marble outcrop. © lobojack, www.hikr.org



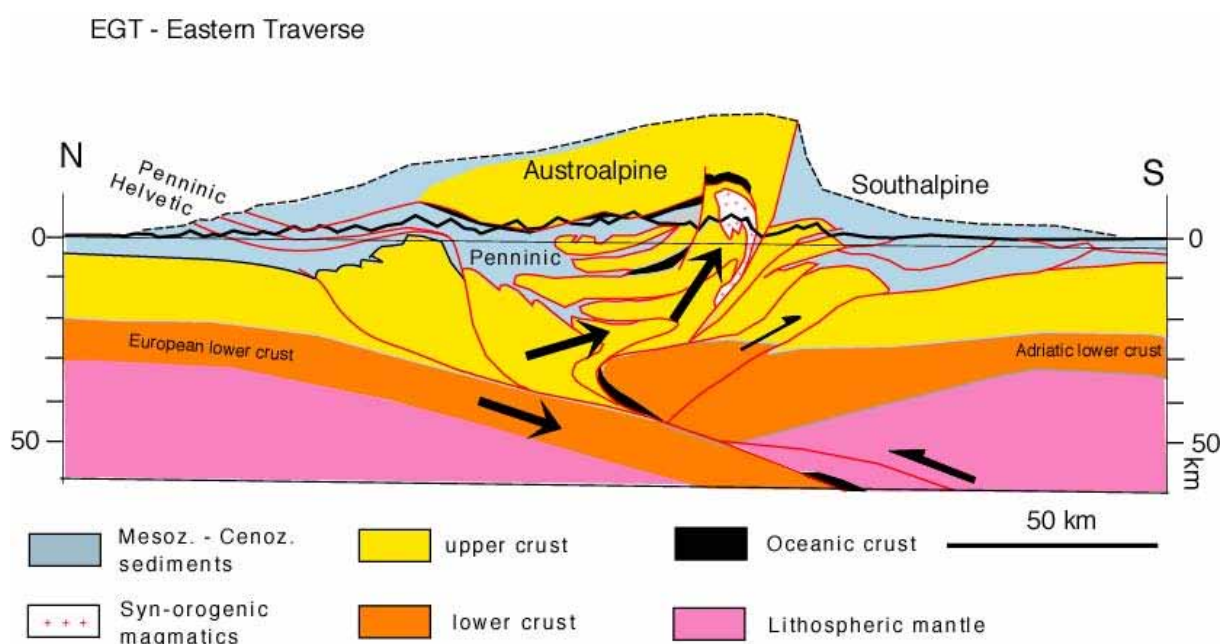
Lago Tremorgio below the Alpe Campolungo. This site is known for yellowish scapolites of gem quality. The hiking trail to Campolungo is on the left side.

The marbles at Campolungo were studied by several mineralogists. For gemmologists by far the most relevant study was published in 1939 by Eduard Gübelin in the Swiss Mineralogical and Petrographical Journal (E. Gübelin 1939; Die Mineralien im Dolomit von Campolungo (Tessin). Schweiz. Min. Petrogr. Mitt., Vol. 19, pp. 326–442)

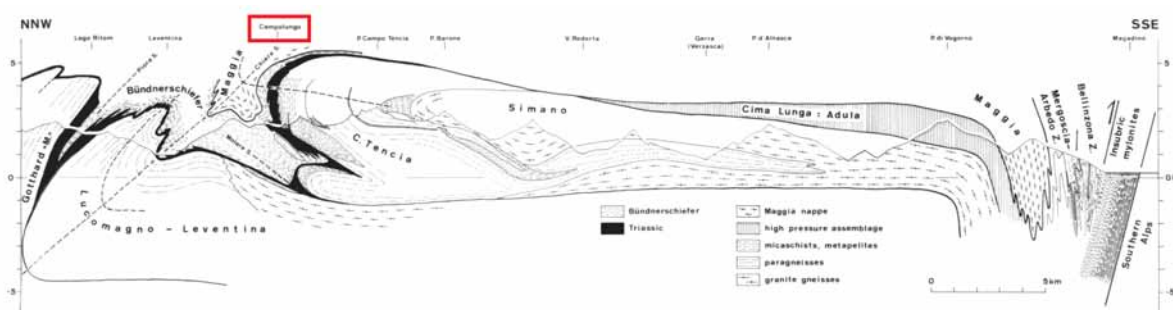
The visit of this classical mineralogical site has been organised not only due to pure mineralogical interest, but also to honour the work and legacy of Dr. Eduard Gübelin as an eminent gemmologist who started his mineralogical and gemmological career at this hidden but spectacular site in the Alps.

General geological overview:

Geologically, the Campolungo is located in the strongly folded and highly metamorphosed central part of the Alps, consisting mostly of gneissic fold-nappe units. Due to a strong NW-SE compression during Alpine orogeny the former crystalline basement rocks together with their sedimentary cover were piled up into large north-facing fold-nappes. These units generally have a granitic core of orthogneisses, and are wrapped by paragneisses and mica schists of Paleozoic sedimentary origin. Between the fold-nappes and at their front, we find Mesozoic para-autochthonous metasedimentary sequences of Triassic dolomite marbles (Campolungo!) and so-called Grisons slates.

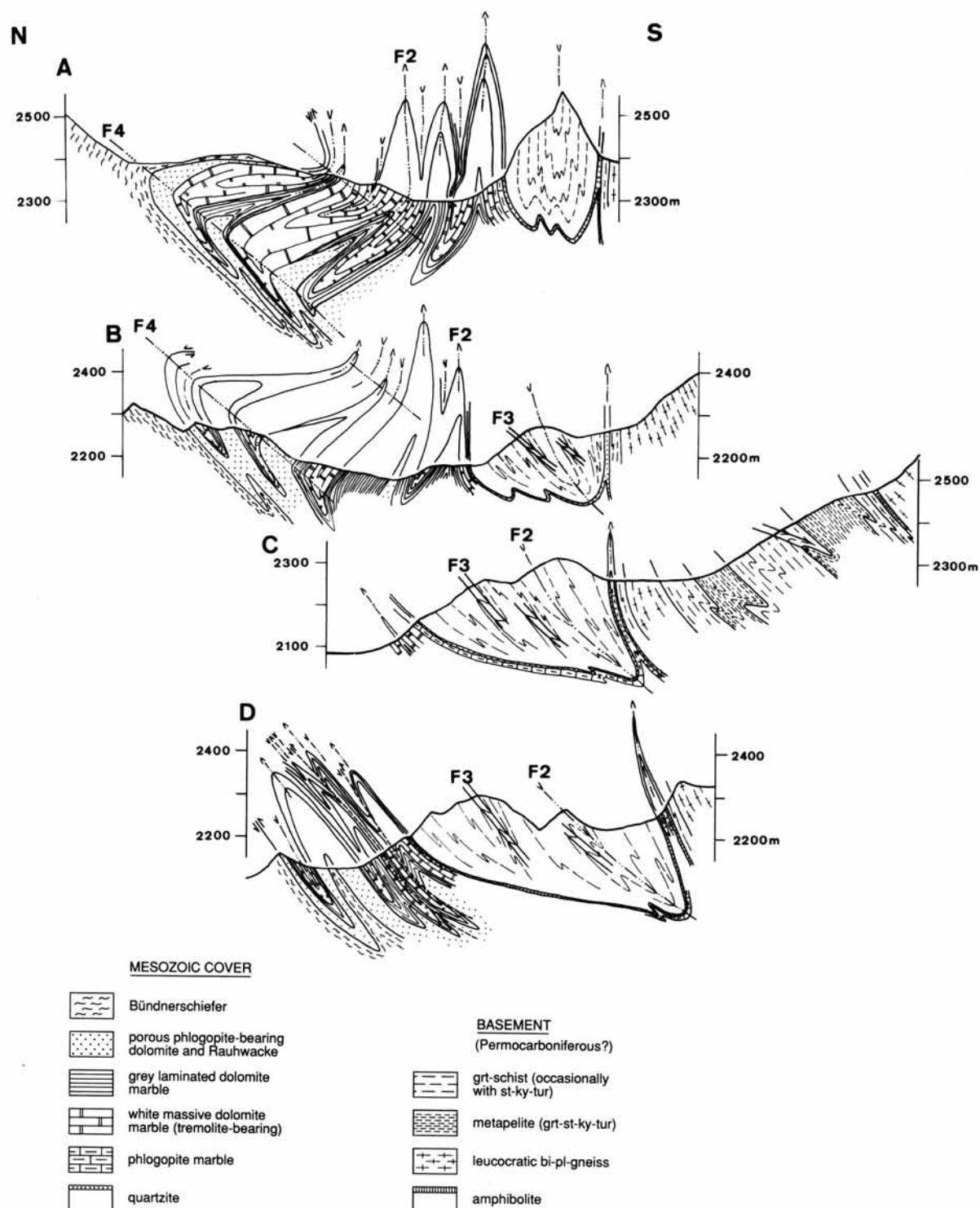


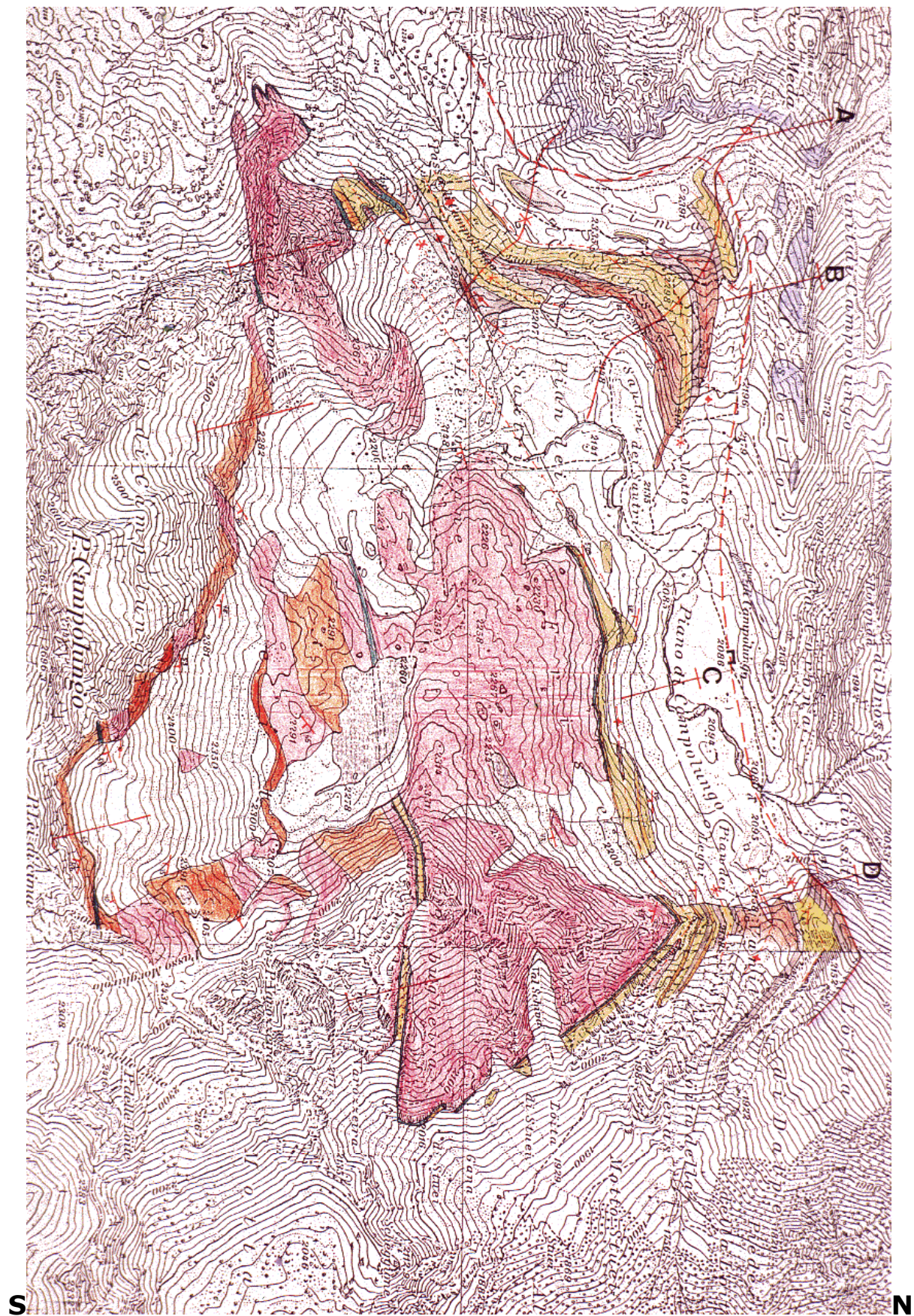
The schematic section through the Alps shows the main tectonic units. The Campolungo is located in the pile of Penninic units (marked in yellow).



A more detailed geological section, showing the position of the Campolungo marbles at the front of the Simano unit. The marbles are wrapping the gneissic rocks of the Simano unit.

A sequence of cross-sections through the Campolungo area, indicating the lithologies in detail.





Geological map of the Alpe Campolungo with the sections indicated.



View from the Passo Venett (2138 m) in direction to the Alpe Campolungo (in the middle) and the Passo Campolungo (2318 m). The white rocks in the foreground and at the Passo Campolungo are the famous marbles in which tremolite, green tourmaline (dravite), and corundum may be found. © Fam. Patzak



View from the Lago Leit to the folded Campolungo marbles at Passo Campolungo. © Fam. Patzak

The minerals from Campolungo:



Diaspore besides pink and blue corundum in marble host-rock (left) and nice pink corundum specimen from Campolungo. © Olivier Roth, collection ETH Swiss Federal Institute of Technology



Green tourmaline (dravite) from Campolungo (length 1 cm) and slightly yellow scapolite (5 cm) from Lago Tremorgio. © O. Roth



tremolite in dolomite-marble from Campolungo.



Book from Carlo Taddei about the minerals from Ticino (southern Switzerland)



Sustenpass:



The Sustenpass is linking the valley of the Reuss river (Gotthard region) with the valley of the Aare river (Grimsel region and Interlaken).

The Fünffingerstöcke, a group of spiky mountains at Sustenpass. © Max Eickholt

At the Sustenpass, we have a spectacular view to the Sustenhorn 3503 m and Gwächtenhorn 3420 m with the glacier Steinengletscher.



Due to global warming, however, this once very impressive glacier has recently lost much of its volume.

Postcard from the 60ies



The Steinengletscher in 1988 © www.raonline.ch



The recent situation. © Freddy Grossniklaus