

Geological highlights of the Val D'Hérens

by
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There are many interesting geological sites in the Val d'Herens. Several of them can be seen in this journey, by car (or postal bus) and by foot, over one or two days, from the bottom to the top of the valley.

The first site is located near Bramois at the mouth of the Borne river. South of the village take the road between the stone bridge and the church that goes to the Longeborgne hermitage. We come to a parking place on the left at the start of the way up. The pedestrian path starts a bit higher up on the right.

1- The Borgne Gorges

On the left bank of the river one can see the [electric power plant of Bramois](#) that produced energy for the production of aluminium in the factory of Chippis since 1918. The path goes up towards the hermitage following the stations of the cross.

<http://www.abbaye-saint-benoit.ch/longeborgne/>



The gorge has been cut in the lower Triassic quartzites of the Zone Houillère (see geological cross-section further down). The quartzites colour vary from light green to grey to white (picture on the left). Outcrops are found all along the path to the hermitage.

At the start these rocks were made of sand rich in quartz, deposited by rivers. The white quartzites may correspond to sand beaches. The rusty small stratas on the picture correspond to input of clay and iron from the continent. Clay has been transformed into mica by metamorphism.

The hermitage is built on the quartzites. Coming down from the hermitage one can take the path going

upstream towards Combioula and the Pyramides of Euseigne (4 h walk), or just stop on the bridge (1/2 h). The path is not very large, take walking sticks with you. Quartzites outcrops, locally white and massive, are found up to the bridge. On the way back take the path along the river that will take you back to the parking.

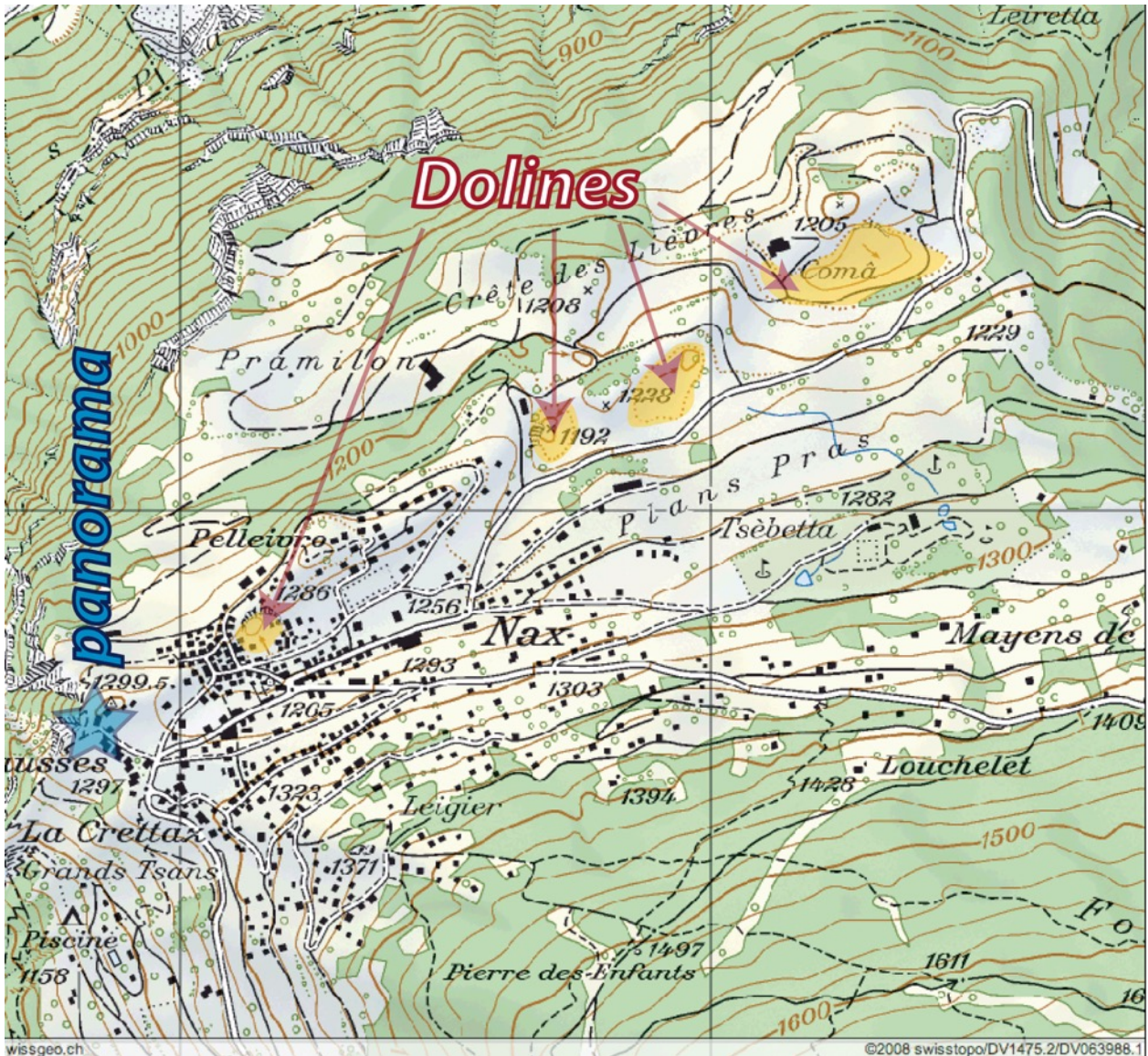


On top of these quartzites a thick series of dolomites and limestones form the cliffs under Nax. These massive dolomites, locally cavernous and rusty, show that the sea level raised during the middle Triassic (240-230 Millions years, My) creating a tropical lagoon environment. At times the lagoon became over saturated and gypsum (St Leonard quarry) or salt (Bex salt mines) were deposited.

From Bramois take the road up towards Saint Martin. On the road one can stop at the foot of the [via ferrata](#), 5 km from Bramois in a hairpin bend, to admire the massive dolomites cliff reaching up to Nax.

After many bends take the road on the left going to Nax.

2-The Dolines of Nax



The site of Nax is characterised by the presence of several dolines (map above) or closed depressions corresponding to the collapse of the rock substratum. The collapses are due to the dissolution of rocks like limestones (e.g. doline from the Jura mountains) or gypsum as it is the case here.



Walking around the dolines one can see numerous outcrops of white gypsum, sometimes with small layers of rusty clay (see picture) rich in iron.

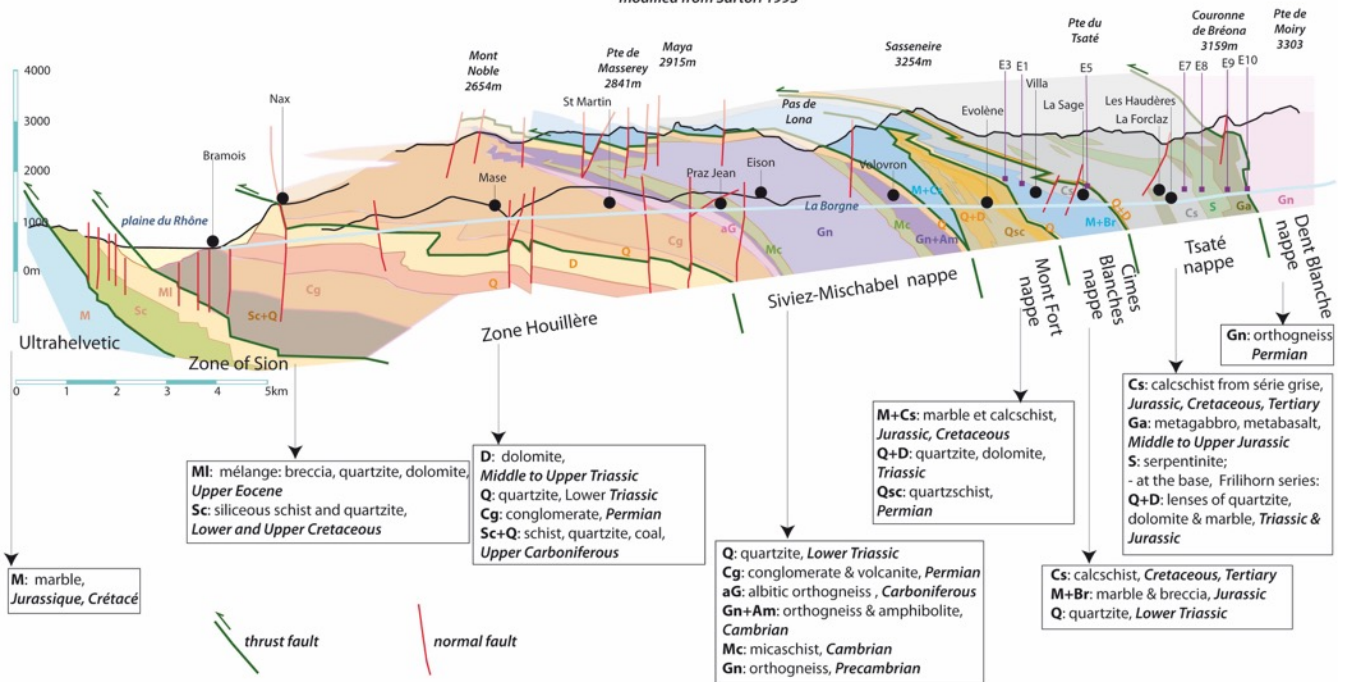
About 100 m on the small path going down from the panoramic point of view on the Rhone Valley there is an outcrop of shiny micaschists of Permian age (upper Palaeozoic) (see picture). These Permian micaschists have been thrust over the younger Triassic yellowish dolomites from the Zone Houillère.



As seen on the geological cross section under, we are here in front of a major thrust of the Siviez-Mischabel nappe over the Zone Houillère (see chapter on the Alpine structures in [Evolene-geologie](#)). The thrust is shown by a green line on the section; younger faults displacing the structures vertically are shown in red.

Geological cross section along the right bank of the Val d'Hérens

modified from Sartori 1993



From Nax it is possible to go to Euseigne passing through Saint Martin. At Praz-Jean take the road down towards Euseigne. After the village the road passes the famous pyramids.

From Nax to Mase the road is following outcrops of shiny schists and micaschists of Permian age. Around Praz-Jean we enter the very old rocks at the heart of the Siviez-Mischabel nappe consisting of Cambrian and Precambrian gneiss and amphibolites (see further down).

3-The Euseigne Pyramids

These 10 to 15 m high impressive natural chimney like reliefs are capped by large blocks. Explicative posters are found on the parking place. We are dealing here with the moraine deposited under the large glacier that covered the whole valley during the last glaciation. (see [chapter](#) on the earth climate). The 2 to 3 km thick ice sheet has compacted the moraine transforming it into some sort of natural concrete, but it can still be eroded by rain and rivers; the blocks inside the moraine are locally protecting it from erosion, thereby creating chimney like reliefs.

>to know more see the [PDF](#) accessible on the page [glaciology of Val d'Hérens](#), and that proposes field trips on the glaciology of the region of La Luetete-Enseigne.



Down the valley along the Borgne river are located the hot water springs of Combioula. To reach it take the road to Sion for 2 km and after the tunnel take the small road on the right going down to the STEP of Hérémece.

4- The hot water springs of Combioula

From the Sewer Plant of Hérémence (STEP) continue downstream by foot along the track up to the bridge. A bit further down explicative posters are located in front of the springs. To go to the springs cross the river on the bridge and walk the small path downstream to reach the river bank where small pools have been dug out (picture below).



old well head

The earth's geothermal gradient increases in average of 30° per km of depth. The surface water filtering through faults to that depth will be warmed up and charged with minerals. The characteristic rotten egg smell of these water springs is due to the presence of sulphur (H_2S). The red colour is coming from the presence of iron oxide. The sulphur could come from the Triassic gypsum (calcium sulphate). On the geological cross section above, the hot springs are located at the level of Mase at the bottom of the valley, one can see that the Triassic series are about 1 km under the floor of the valley.

5- La Lulette

Take the road in the direction of Evolène. At La Lulette stop at the parking place for the view on the other side of the river where pyramids are being formed in the moraine. From the parking it is possible to go down and cross the river to take the path downstream towards Ossona passing by the 130 m [suspended bridge](#).

It takes a good hour to reach the suspended bridge (only 10 minutes from Ossona), to do so take the path under the parking and turn left just after the first barn to join the path going down to the bridge on the Dranse river, then follow the indication (Ossona)

On the right bank of the Dranse along the dirt road we follow outcrops of moraine with large blocks, do not stop under them! this moraine marks a glacial stage when the Herens glacier stopped in the region of La Lulette for a while, before to finally retreat.

> to know more see the [PDF](#) accessible from the page [glaciology of Val d'Hérens](#), and that proposes field trips on the glaciology of the region of La Lulette.

Along the path further down stream, and after crossing the first torrent, we enter into a series of outcrops of Permian grey micaceous schists (former muddy sandstones) that were deposited in grabens (extensional basins) that appeared during the collapse of the Variscan cordillera from the Carboniferous to the Triassic (see chapter on the [old story of val d'Hérens](#))



6- The Mine Museum of Praz-Jean

On the road to Evolène, coming out of Praz-Jean on the right, is located a small exhibition of mining tools (pictures below)

<http://www.herens.info/mine-praz-jean/index.htm>



The region of Praz-Jean had several mines in the past (see [chapter](#) on human intervention). Lead, zinc and silver were mined at the beginning of the 19th century until 1943 in the Comtesse and La Barma mines.



galena from Praz-Jean mine

7 - The glacial threshold of Lana

Before to arrive in Evolène the road cuts through the glacial threshold of Lana at the level of timber yard. The rocks forming the threshold are very old (>500 My) and resisted erosion. They consist mainly of amphibolites (metamorphic rocks), former volcanic rocks emplaced in a cordillera like the present-day Andes (see [chapter](#): long, long ago in the val d'Hérens). These rocks belong to the Siviez-Mischabel nappe. Many things happened since these remote times...



amphibolite from Lana
that could correspond
to an older lava flow

In Evolène we enter the Mont-Fort nappe characterized by quartzites (metamorphic sandstones) of Permian and Triassic age, which form the cliffs above the village. Going out of the village on the left we find the [Via Ferrata](#) located in the Cimes Blanches nappe that extends up to La Tour. This nappe represented the margin of the European continent at the time of the alpine ocean.

8-The southern border of the European plate

The grey marbles cliffs on both sides of the valley as one goes to Les Haudères are made of breccia and micro-breccia. A significant outcrop of these is found at the level of La Tour. To see those, when arriving in Les Haudères, take the small road to the left at the level of the camping (which is on the right of the road). This route du Lagec goes up to La Sage.



It is preferable to park at the beginning of the road as it goes up and continue on foot.

First, the road goes through outcrops of grey massive calcschists, then white dolomites (the picture on the left taken at $46^{\circ}5'53''N$ $7^{\circ}30'26''E$, shows the contact between the calcschists and the dolomites).

This sliver of Triassic rocks represents the southernmost outcrop of the European margin. It marks the former plate limit between Eurasia and Africa. South of this outcrop lays the Tsaté nappe representing the former Alpine oceanic domain; the sliver of dolomites and calcschists is the Frilihorn unit.



After passing two small streams we arrive in the breccia of the Cimes Blanches nappe. The outcrop located on a small round hill a bit further on the left of the road (picture taken at $46^{\circ}5'35''N$ $7^{\circ}30'37''E$) presents a polished surface due to the passage of the glacier, with beautiful plastic folds of the breccia sequence, locally quite coarse.



These breccia are coming from the erosion of the European plate border during the opening of the rift that separated Pangea into Eurasia and Gondwana (comprising Africa) in the lower Jurassic times (180 Ma) and which finally resulted in the opening of the Alpine ocean around 160-170 Ma.

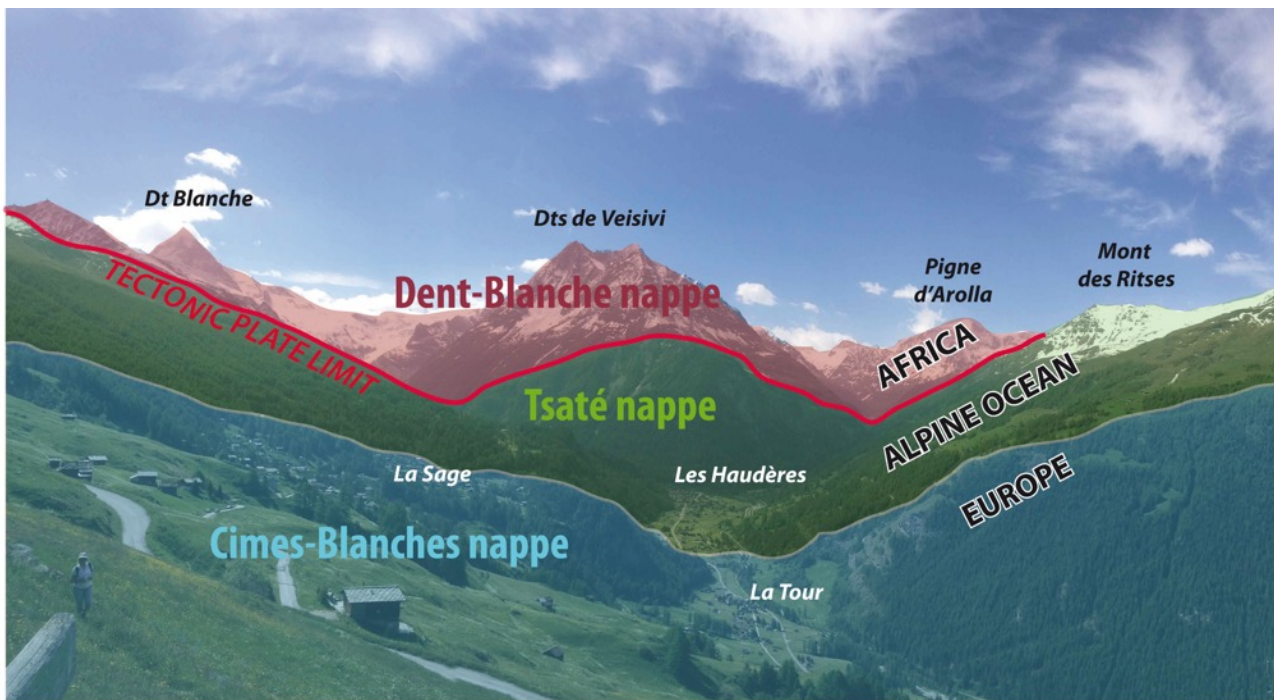
The white fragments (clasts) of the breccia are coming from the Triassic and lower Jurassic series, eroded on the rift shoulder and deposited as gravitational flows (turbidites) within the rift basin.

The folds are much younger dating from the onset of the formation of the Alpine mountain range 30 to 40 Ma ago.

9 - The alpine ocean

At Les Haudères, we reach the Tsaté nappe presenting remnants of the Alpine ocean (serpentinites, gabbros, basalts) that existed from the middle Jurassic (175 My) until the onset of the formation of the Alps (about 30 My ago). It was the closure (subduction) of this ocean that created the mountain belt.

The European plate was dragged under the African plate (Dent Blanche nappe) by the subducting ocean, then the colliding plates were uplifted when the ocean totally disappeared into the Earth's mantle.



Several field trips are proposed on this theme, mainly the one called «[from one continent to the other](#)» also available as a smart phone and tablet application ([iOS/Android](#)) that allows to locate yourself in the field. The Centre de Géologie (photo on the left) at Les Haudères, proposes a new exhibition on the glaciology of the region, a must!

The end of the valley (Ferpècle) can be reached taking the road going through La Forclaz. The Mont Miné glacier can be reached by foot although the walk is increasingly difficult due to the spectacular retreat of the glacier during the last 30 years.

The field trip A ([iOS/Android](#)) allows to guide oneself in this region.