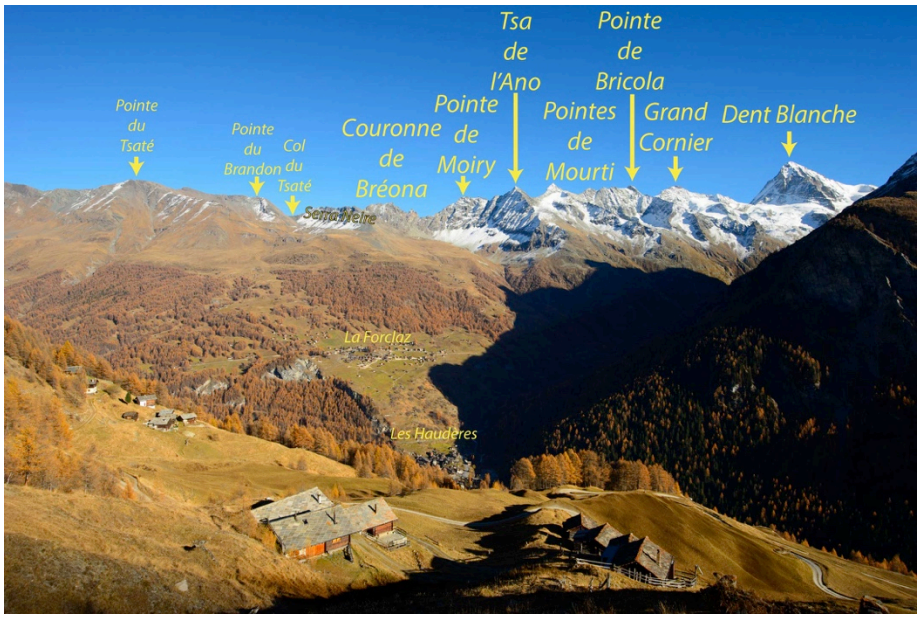


Excursion-C: La Gouille - Evolène

La Gouille – La Coûta – La Cretta – La Gietty – Arbey – Evolène

by Pierre Kunz (an excerpt from the booklet *Three Geologic Field Trips in the Commune of Evolène "Upper Val d'Hérens-Valais" published by Evolèn'art); revised and updated by Gérard Stampfli and Sebastien Ruttimann. Translation by Charles Gutowski*

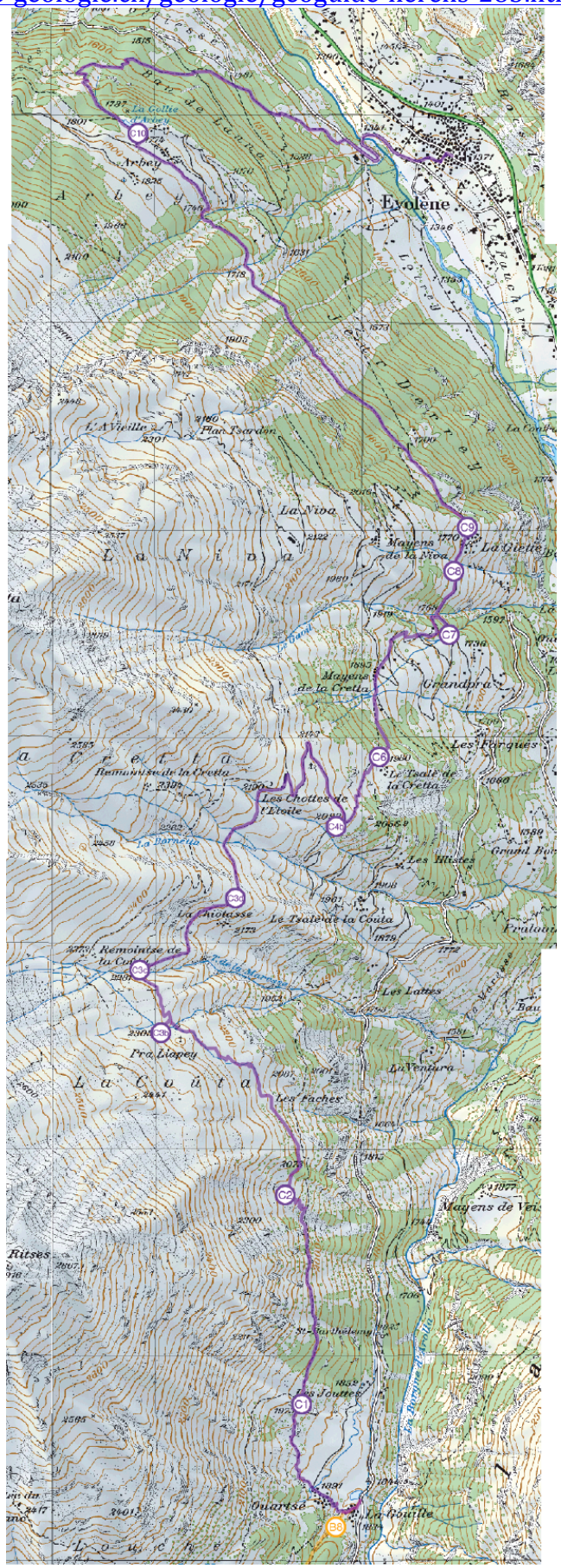
This geological field trip takes us across the ancient alpine ocean to rejoin the European continent along the left bank of the Val d'Hérens**. At the same time, we have a panoramic view of the right bank** setting out the arrangement of the various nappes (Siviez-Mischabel, Mont Fort, Cimes-Blanches, Tsaté and the Dent Blanche) , as well as **numerous examples of geomorphological land forms**. **Caution! This field trip is relatively long (15 km, equivalent to an effort of about 25km) but it can be done in parts, for example by leaving from Les Lattes or Les Farquès**.

Description

- Departure from La Gouille (1834m).
- We pass through the hamlet of La Gouille following the signs indicating " Lac Bleu". At the summit of the village we go right, direction Ouartsé-Mayens de la Couta. The path, rather steep, makes several hairpins on a slope strewn with metabasalt blocks, then passes through the hamlet of Ouartsé (1891m).
- Leaving Ouartsé we go to the right on the pasture road passing in front of a fountain, then 50 m further on, at 2020m, we take the chemin La Coûta- La Gietty. The last chalets in Ouartsé are built right at the limit of the fallen rock zones and the great corridors of annual avalanches descending from the Mont des Ritses. Just uphill from the hamlet, a massif outcrop of very schistose green-yellow metabasalt is flaking apart (brown –black alteration).
- The pathway continues toward the base of the grand avalanche corridors and zig-zags through "de-stoned meadows " with their piles of stones (which facilitate mowing). At the upper limit of the mowed meadows, we can see the vestiges of an ancient bisse, which served to water the fields.

Parcours

See the itinerary interactive map available in the GéoGuide Val d'Hérens (« Map» tab)
http://www.evolene-geologie.ch/geologie/geoguide-herens-285.html



Stop C-1 (603713/100760) (46° 3' 30.1" 7° 29' 11.83")

Panorama towards the east (Photo : G. Stampfli)

The path La Gouille - La Coûta, above Les Jouttes, a rocky ledge (meeting with Field Trip "B" coming from Le Lac Bleu).
The path climbs along a small rocky ledge, comprised of crushed metabasalts, before entering a forest of larch trees (mélèzes). **From this site we have a splendid view over the Val d'Arolla (the Veisivi massif, the Arête de Tsalion, La Gouille, Ouartsé, Mont Collon, the pigne d'Arolla)** and in particular over the large, relatively massive rock faces of gray calcschists making up the base of the Petite Dent de Veisivi (see stop B-8).
The zone separating Stop C-1 from the avalanche corridors of Ouartsé is called *"Les Maisonnettes"*. It is a region covered with heather, briars and rhododendrons and strewn with numerous fallen blocks.

- The pathway now enters the forest of larches and heather, among large boulders. These are **highly fractured metabasalt schists, sometimes with beautiful, tight folds. Here locally we can find traces of ancient quarry sites where slate was mined for the roofing of chalets**.
- Facing the prairie of Les Mayens de Veisivi (on the opposite bank) the path becomes more irregular and bumpy and passes through growths of alder bushes. After a marked curve to the left, **we leave the Val d'Arolla and enter the Val d'Hérens**. Here the pathway crosses an avalanche corridor above galleries placed to protect the Arolla road. Above us are enormous blocks of metabasalts, relatively schistose and folded, fallen from the Mont des Ritses.
- At 2030m, the pathway winds through a large fallen rock zone, comprised of ancient boulders plus other more "freshly fallen" metabasalts, very light green in color and locally micaceous. On some of these blocks we can see some handsome green-yellow-white bedding with cylindrical 10 cm folds. **This zone is relatively unstable and there is a very real danger of a landslide (do not stay here too long!**).
  The pathway through the alder bushes is very damp.
- Before arriving at Les Faches, the path leads along a hillside through a superficial landslide zone (trees and alders leaning over at their bases).
-

Stop C-2 (603632/101777) (46° 4' 3.037" 7° 29' 8.122")

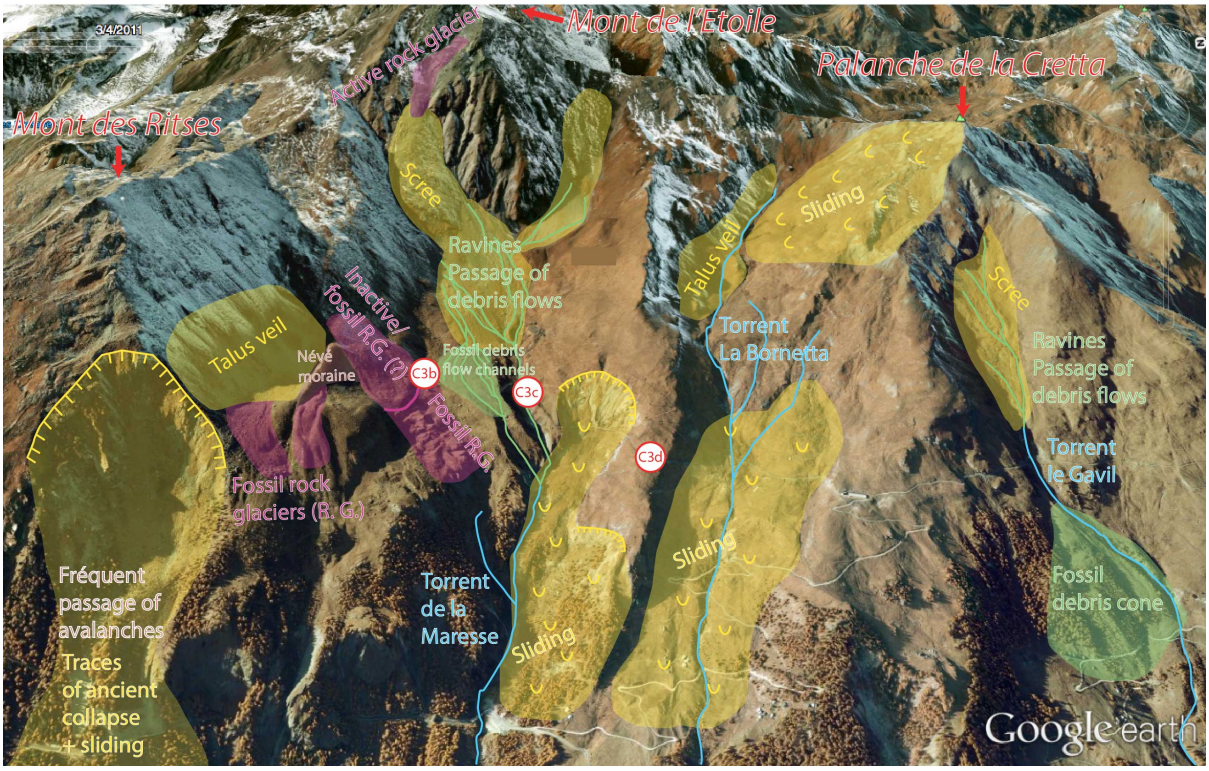
Path La Gouille-La Coûta. Place name : *"Plàn Motanék"* [Les Faches].

A handsome panorama of the Val d'Hérens (Arête du Tsaté, the Veisivi Massif and the Arête deTsalion). This terrace rests on the summit of a rock face through which passes the tunnel of the Arolla road.

We now find ourselves in a geologic transition zone: the Mont de Ritses is made up exclusively of metabasalts in the form of a large unit of lavas; but after the C-2 site in the direction of La Coûta-La Cretta we come upon a sequence of sedimentary schists characterised by a more gentle topography (pastures situated in the Gray Series or Série Grise). Between these two units, the path crosses a succession of rock faces and vertical rock bars composed at the same time of metabasalts and oceanic schists (between Les Faches-La Coûta). These two lithologies are mixed up together and constitute a heterogeneous mass (see rock faces of Roc Durand – Lieufanc, Field Trip "A") representing the ancient accretionary prism or wedge.

The pathway from Les Faches to La Coûta has become too unstable and dangerous to cross, so we must make a detour avoiding the lower part of the Torrent de la Maresse. The Stop C-3 is therefore no longer accessible. But our detour nonetheless crosses some very interesting geomorphological land forms (see map) as well as the volcano-sedimentary features of the ancient alpine ocean rift.

The main geomorphological objects we come upon are a fossil rock glacier at C-3b, some ancient torrential lava channels just before C-3c and two surrounding landslides C-3d. The rest of the hillside shows numerous other land forms which can be seen on the simplified geomorphology map.



Simplified geomorphology map

From Les Faches we take the path going up in the direction of the Alpage de l'Etoile. We climb through a rockslide zone with very large boulders, which could be interpreted as an ancient rock glacier.

Stop C-3b (603028/102565) (46° 4' 28.547" 7° 28' 40.023")

After passing a small hill with a cross, we continue to the Mayen de Pra Liapey. **The mayen is supported on a large block consisting of a volcano-sedimentary sequence typical of the alpine ocean**, that is to say greenish volcanic tuffs (prasinites) interspersed with more resistant beds of a siliceous nature, probably ancient radiolarites. These small beds are made up of **siliceous plankton skeletons called radiolarians**. All through the rock fall zone we can also see the siliceous nature of the flora with rhododendrons and blueberries

This stratigraphical sequence was laid down on the ocean floor below the calcite compensation depth (CCD), the water depth below which calcareous shells are dissolved by the high levels of CO2, which increase the water's acidity level. **In the Jurassic period this sea depth is placed at about 4000m.**

Typical volcano-sedimentary sequence of prasinites and ancient radiolarites (Photo : G. Stampfli)

The terrain on which the mayen is built is very chaotic. It is in fact the lower part of a rock glacier (R. G.) whose tongue has become fossilized. But the upper part of this rock glacier is nonetheless clearly marked by a front still standing stiffly just uphill from the mayen. It is clearly a rock glacier inactive since the end of the Little Ice Age (LIA). The chaotic aspect of the terrain where the mayen is built is due to the fact that certain zones probably **lost their ice content more rapidly than others and the zones still rich in ice continued to flow downhill, creating these forms of successive" terraces" followed by stiff standing fronts**. The actual localization of the mayen is very interesting since it permits us to speculate on when activity in the two parts of the rock glacier ceased. **Effectively, the lower, downhill part is probably inactive since the warming at the end of the Tardiglacière period** and the front has moved back up to the part more clearly marked where it is today (the front above the mayen). **This is a fairly current phenomenon with alpine rock glaciers.**

The Mayen de Pra Lapiez would certainly not have been built on a zone in movement and most probably not at the foot of an active land form, so we can infer that the fossilization of the lower part of the rock glacier preceded the construction of the mayen and that the upper part has thus been inactive for quite some time.

We can also admire some other geomorphological land forms along the path by using the simplified map (rock falls, talus veils, landslides, ravines, debris cones.....)

Stop C-3c (602926/102870) (46° 4' 38.42" 7° 28' 35.292")

We continue on the path until crossing the Torrent de la Maresse where we can **note in passing the fossilized traces of the passage of torrential lavas originating from the Mont de l'Etoile** (torrential lavas leave behind them kinds of mudflows of deposited materials forming a series of buttes across the pathway). Also visible in the torrent are **numerous blocks of prasinite (metabasalts) that have come down from the Mont de l'Etoile massif and which represent fragments of the oceanic crust from the ancient alpine ocean.**

Torrent de la Maresse and numerous blocks of prasinite from the massif of the Mont de l'Etoile (Photo : G. Stampfli)

Detachment plane of a landslide (Photo : G. Stampfli)

Continuing along the path brings us into the calcshists of the Série Grise (Gray Sequence), that is to say **sediments laid down on the floor of the alpine ocean which then accumulated in front of the African continent during the subduction process of the ocean floor toward the south** (see also Stop E-7). The large combe above the pathway (photo) represents the detachment plane of a landslide, this whole region in the calcschists being very unstable.

Stop C-3d (603385/103217) (46° 4' 49.66" 7° 28' 56.67")

We are now in view of the Alpage de l'Etoile (603392/103258) on a promontory of gray calcschists with numerous veins of white quartz. **These veins indicate that these oceanic sediments have been buried to a depth of 20-30 km during the subduction process**. The water contained in these sediments having been expelled, they are now rich in silica (quartz) and calcite derived from the shells of marine plankton deposited on the ocean floor for millions of years. **As the water circulates toward the surface it cools and the quartz and calcite become deposited in the veins which are then deformed by the subduction process.**

Locally we can see that these calcschists are made up of a sequence of small, centimetric bands (distal turbidites) along with more clayey intercalations.

The depression we can see between this promontory and where the alpage is situated **is in fact the site of another large-scale landslide.**

From the alpage, we redescend toward the site C-4b. After passing by the alpage and taking a hairpin turn, the Matterhorn appears to the right of the Dent Blanche.

Annotated panorama. In particular we see the Matterhorn appear to the right of the Dent Blanche (Photo : G. Stampfli)

Stop C-4b (603872/103565) (46° 5' 0.912" 7° 29' 19.323")

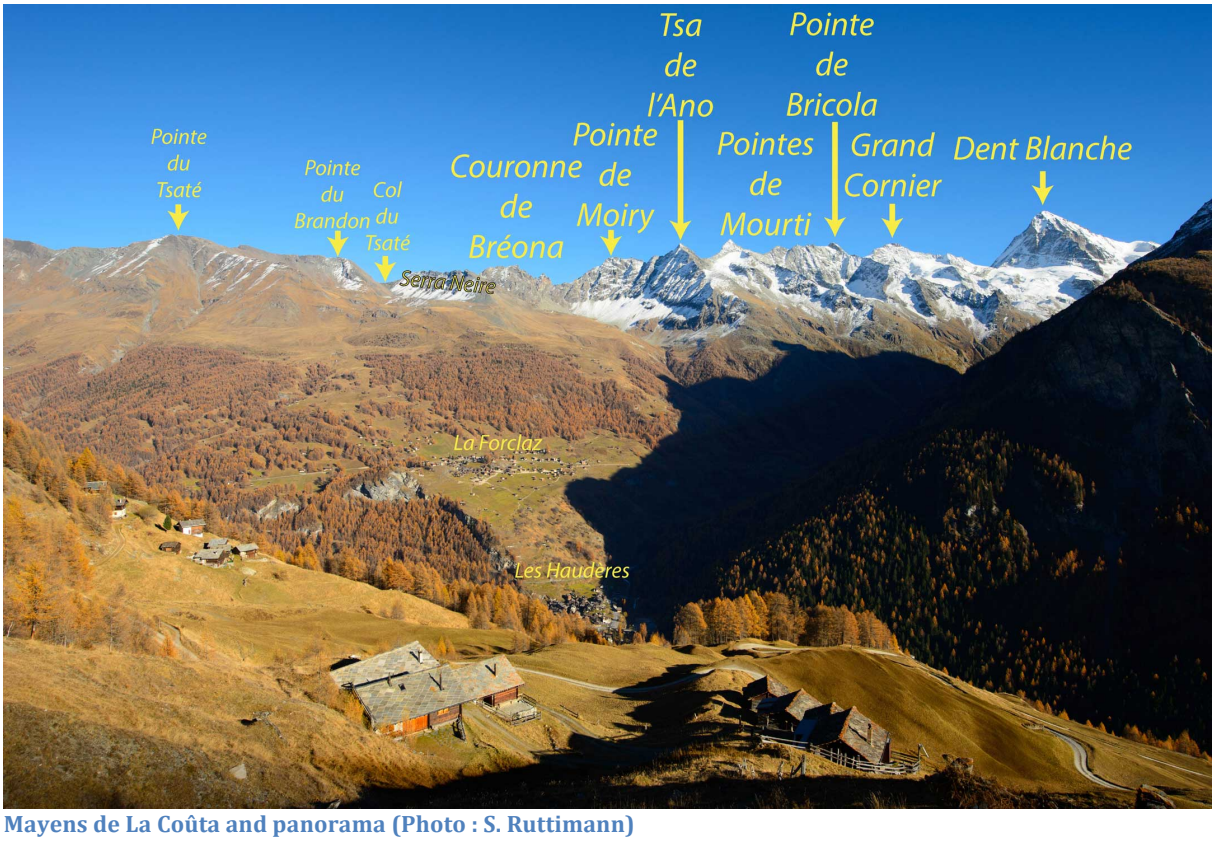
The pathway between C-5 et C-6 has become dangerous due to of landslides. To avoid having to descend and climb back on the same pathway, the Stop C-4 has been moved to just after crossroad leading to C-6. However, it is still possible to descend down to the former stop C-4 (603877/103189), to cross the Mayens de la Coûta C-5 (604116, 103472) and then to climb back via the road. The red marker plaques have not been moved.

From this spot, **we have a magnificent panorama of the Val d'Hérens and the Val d'Arolla**. In particular we can see the so-called villages on the rocks "Sur les rocs": Villa, La Sage, La Forclaz and Bréona as well as Les Haudères at the bottom of the valley. **In the Veisivi massif, we again find the structural contact between the nappes of La Dent Blanche and Le Tsaté passing above Le Roc Vieux. The face of Le Roc Vieux and the promontory of Les Mayens de Veisivi are very massive metabasalts.**

The La Coûta pastures are characterised by a soft relief due to the presence of very clayey oceanic sediments. But locally there are also outcrops of more massive calcareous rock bars with a gray-black tower-like aspect as in the rock face dominating the former site C-4.

Just above the Mayens de La Coûta (note the slate roof shingles made from lustrous schists) a larch forest begins at the foot of a face of dark green metabasalts at an altitude of around 2000-2050m.

We climb back to the point 2092m and then descend on the pathway to Tsalet de la Cretta and C6.



Mayens de La Coûta and panorama (Photo : S. Ruttimann)

Stop C-6 (604081/103902) (46° 5' 11.828" 7° 29' 29.075")

Tsaleù de La Cretta and panorama (Photo : S. Ruttimann)

Alpage (*"tsaleù"*) de La Cretta, group of chalets near a cross.
We are now in the center of a large mass of lustrous schists (Série Grise calcschists). The ease with which the bedding planes come apart and erode accounts for the characteristic soft topography of these pastures. Here and there we see some blocks of metabasalts and serpentinites as well as some marble massifs. Above us, are two crosses atop a rock face rising to the west toward the Palanche de la Cretta. On this rock face we can also find some isolated lenses of serpentinites and pierre ollaire which have been exploited at times in the past.
The pastures here are covered by morainic material. **A multitude of small irregular pathways taken by animals (cattle and even chamois!) have been distorted by reptation or creeping. The water-laden terrain swells up and then creeps down by small steps following the cycle of freezing and thawing.**

At 1960m, we take the path descending toward Les Mayens de La Cretta, passing through a forest of larches where a few calcschist blocks can be seen. We pass under an orange marker sign very visible from afar at more than 3m high on a larch tree!
At 1890m, we pass by Les Mayens de La Cretta (three chalets next to each other) and rejoin the Route de La Niva. We cross the road taking a shortcut and rejoin it again 50m downhill. We continue descending for another 100m to a large hairpin turn and then take a small path going down a slope, then zigzag to the bottom of the combe. Once there (at about 1780m) we cross a small torrent and go immediately to the right on a pathway going below an isolated chalet (sign on a larch tree) . This pathway descends along the side of a butte in a forest of larches and leads quickly to the Route de La Gietty.
Here we take 5 minutes on a round trip along the Route de La Gietty and reach in about 100m the next stop C-7 in the direction of Les Haudères.

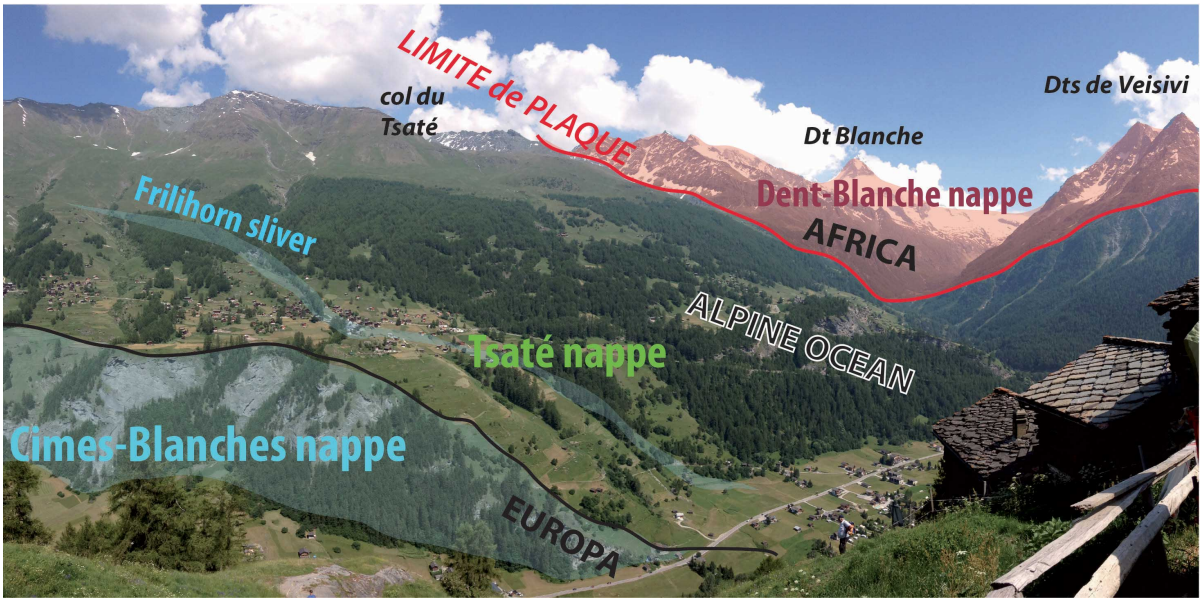
Stop C-7 (604423/104494) (46° 5' 30.994" 7° 29' 44.988")

Beginning of the Route de La Gietty, sharp bend. Place name: *Gavil.*
On this spot, the Route de La Gietty is dominated by a rocky spur of massive serpentinites. With a dark green to black patina, these rocks locally show a soapy or shiny aspect which gives them a "serpent-like" appearance. In the fissures, there are sometimes light green needles of asbestos.
This whole outcrop is divided into small isolated lenses. At one spot (just to the right of the sign C-7), a glacial pothole has been hollowed out across the serpentinites, highlighting the fractured structure of this rock.
We again pick up the Route de la Gietty in the direction of Evolène, skirting the blocks of serpentinite.

Pothole hollowed out in serpentinites (Photo : S. Ruttimann)

Stop C-8 (604444/104803) (46° 5' 40.999" 7° 29' 45.973")

Route de La Gietty, 200m before this hamlet.
Bordering on the Route de La Gietty are numerous outcrops, one of which is a large rock a few meters in size. These are oceanic sediments, relatively schistose, making up the Série Rousse (Red Series) attributed formerly to the Mont Fort Nappe but now part of the Cimes Blanches Nappe. **This site is in effect the northern border of the alpine ocean; from the site C-8 onward, we are in the European continental platform.**
This new nappe starts out with clear yellow rocks with a tuff-like aspect (dolomites and cornieules) representing the narrow limit between the continent and the ocean. Then come the massive gray limestones (recrystalised marbles), such as the large block made of gray calcschists measuring several meters from the site C-8. Nearby we find some outcrops of dark to black bedding with alternating massive, schistose sediments (a kind of flysch) . These outcrops are relatively fractured and broken up; they continue on up to the hamlet of La Gietty (1770m). There the road climbs up slightly and skirts some massive gray rocks with a yellow-ochre patina. These are the light colored, homogeneous marbles of the Meina Unit (Nappe des Cimes Blanches) . We note the very intense micro folds of micas all through the rock. Fracture planes are highlighted with white calcite, the bedding is oriented toward the south with a dip angle of 40°.



Annotated panorma of the Val d'Hérens (Photo : G. Stampfli)

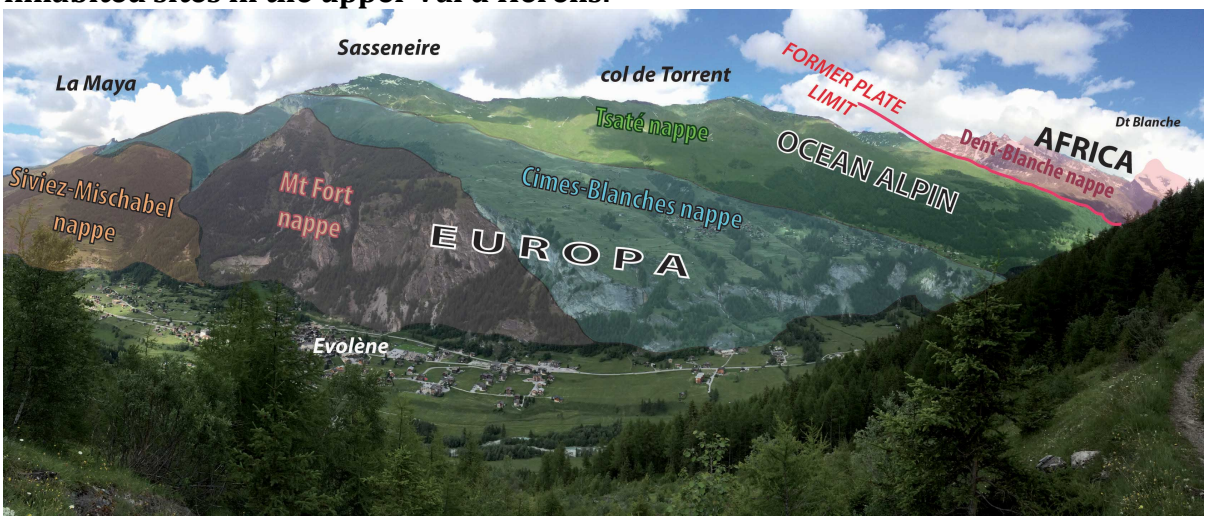
The rock faces below La Forclaz are composed of metabasalts (Nappe du Tsaté) while those below La Sage and Villa are made up of calcschists and marbles (Nappe des Cimes Blanches) . The Nappe du Tsaté owes its name to the massive summit facing us, going toward the south from the Arête Sasseneire-Col de Torrent-Pointe du Tsaté (3078m). The boundary of the oceanic Nappe du Tsaté (Série Grise) and that of the continental Nappe du Mont Fort (Série Rousse) passes by a ravine situated between the sites C-7 and C-8, crossing the bottom of the valley and climbing back up the right bank in the gorge just above la Sage (Ecaille du Frilihorn) . It then reappears beneath the summit of Sasseneire. Thus the **entire Arête Sasseneire-Tsaté is part of the oceanic Nappe du Tsaté which extends up to the Couronne de Bréonna (gneiss) , where we find the tectonic contact line with the Nappe de la Dent Blanche**

Here we cross a new avalanche corridor (notable avalanches in 1918 and 1996).

Stop C-9 (604508/105020) (46° 5' 48.029" 7° 29' 48.966")

End of the Route de La Gietty (parking).

Historically, the Mayens de La Gietty (or *Giette*, more precisely *Haute Giette*) was originally an important village up to the 17th century and **was in fact one of the first inhabited sites in the upper Val d'Hérens.**



Annotated panorama of Evolène and the Sasseneire (Photo : G. Stampfli)

In its lower part, the Val d'Hérens changes its face somewhat; **the geology is mostly sedimentary rocks (with parted bedding planes, tower-like aspects) while the vegetation becomes sub-mediterranean (pines and shrubs).** The Montagne Sasseneire facing us shows a large, recumbent fold pinched out toward the south. The core of this fold is made up of brown conglomerate materials (breccias) plus dolomites and quartzites belonging to the Meina and the Evolene units. This fold is part of a larger group of calcschists and marbles with a brown patina belonging to the Série Rousse (Red Series, Nappe des Cimes Blanches) situated structurally just below the Nappe du Tsaté comprising even the summit of the Sasseneire. **The rock faces dominating Evolène are mainly part of the Nappe du Mont Fort and are made up of quartzites, dolomites and marbles.** The arête going north from Sasseneire in the direction of La Maya intersects geological units even more "European", with the Nappe de Siviez-Mischabel (continental basement)

Gray marble and sandy level (Photo : G. Stampfli)

Outcropping

The massive rock bar descending from the Mayens de La Niva down to La Borgne is intersected at La Gietty by the Chemin du Lac d'Arbey. The rocks here are made up of massive gray marbles and dark colored breccias. The conglomerate aspect is highlighted by the local presence of quartz and calcite elements. This rock face belongs to the Evolene Breccia Sequence (part of the Cimes Blanches Nappe) , more largely found in the region of the Pic d'Artsinol (2998m).

In the gray marbles, bedding planes and folds highlight the schistosity and the complex structure of this outcropping.

In the parking lot, we catch a glimpse of another type of rock inside a double fold of marbles. It is a lens, a metre wide and about 10 m long, made up of re-sedimented crystalline elements ("regenerated levels ") originating from the continental European basement (the pencil shows the location of the sandy level), These sandstones originate from the erosion of the nose of a large tilted block; and the gray marbles, locally microbrecciated, represent the filling in of this area. (see geologic introduction and itinerary E). This lens, with its gneissic aspect, is rich in veins and fissures"en échelon" of quartz. In addition, this outcropping also shows some handsome glacial polishing.

Leaving the parking lot, we take the direction of the Lac d'Arbey (1770m). The beginning of the road again cuts through the large rock face described above.

We now pass through terraced pasture lands. In the forest at 1760m we come to an intersection of two paths. Here it is possible to descend directly to Evolène without passing by Arbey. Otherwise we can take the horizontal path direction La Niva, and then 50m on, the path leading to Arbey, Right here we see an outcropping of black schists with highly split or parted bedding planes.

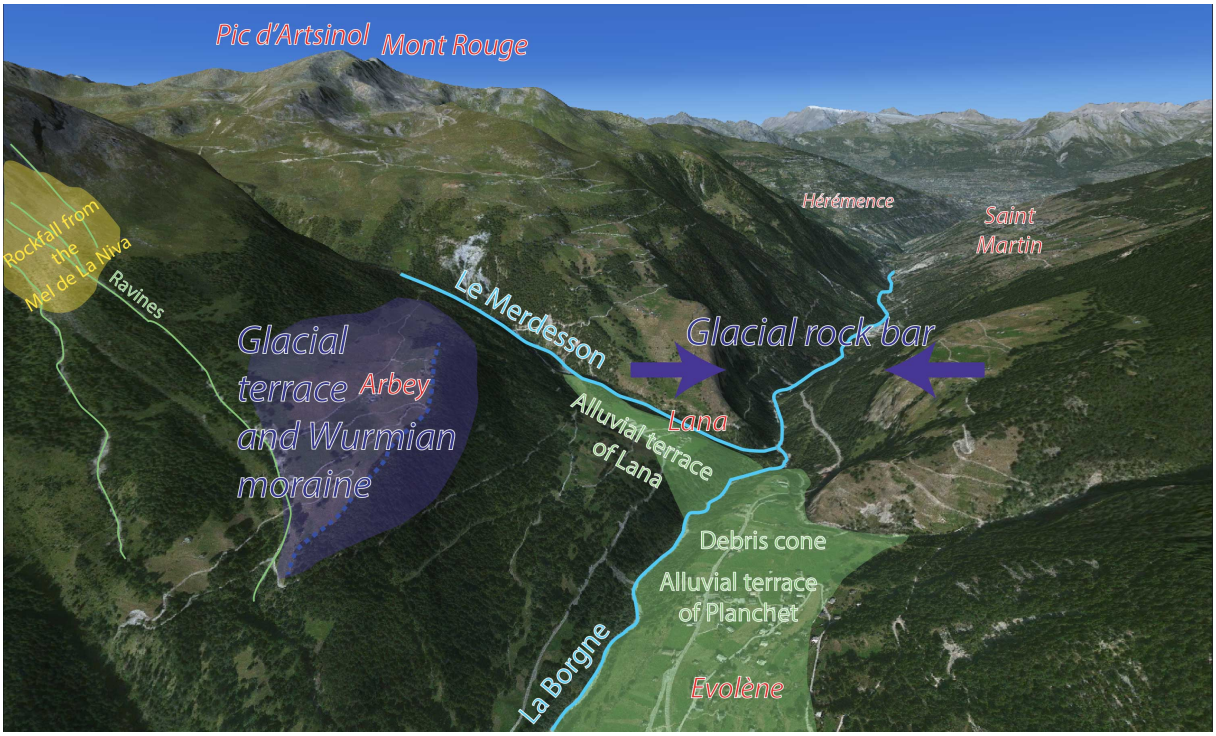
The road continues on horizontally (1740 m, 603770/105848) and **crosses some large ravines where gray calcschist boulders from the La Niva rock face have rolled down as far as the La Borgne. In the winter these ravines also become avalanche corridors** (important avalanches in 1917, 1918, and 1935). We can still see some of the damage wrought to the forest due to the storm "Viviane" on Feb. 27, 1990. There is also an excellent unobstructed view of Evolène.

About one kilometre on from La Gietty (603436/106281), there is an outcropping of dark calcschists in one of the corridors which is also a torrent bed. **Do not linger in these ravines!**

At 1750m (603222/106508), just before rejoining the Route d'Arbey, we pass by a very eroded gorge with landslide scars (niches d'arrachement) situated just above the road. This landslide zone is composed of highly permeable morainic material and **can become very unstable when there is heavy precipitation**.

We now rejoin the Lanna-Arbey road, going to the left and leading up to the lower hamlet of Arbey situated some 300m farther on (1760m).

Arrêt C-10 (602917/106911) (46° 6' 49.3" 7° 28' 34.963")



Simplified geomorphological map

The southern border of the Lac d'Arbey, near the last chalet. Panorama of the Val d'Hérens, with Les Dents de Veisivi, La Dent Blanche and the Matterhorn (Nappe de la Dent Blanche)

We are on a hanging terrace "épaulement" or glacial shoulder directly facing the villages "Sur les Rocs" (Villa, La Sage, La Forclaz). This glacial terrace is most probably inherited from the last glaciation period (about 10'000 years ago).

Les Mayens d'Arbey are dominated by the steep summit of the Mel de la Niva (2760m) which consists in part of the calcschists of the Nappe du Tsaté and in part of the breccia sequences of the Evolene Unit (Nappe des Cimes Blanches) . In effect, this summit represents the limit between the Alpine Ocean and the European Continent.
The Lac d'Arbey is tightly enclosed by two morainic taluses; just below them are outcroppings of calcschists and breccias. The origin of the lake could be due to overdeepening by glacial erosion. The lake has no tributary and no outlet; its level depends solely on precipitation. Care must be taken not to pollute the waters as they will not be revitalized or renewed!
We pass alongside the lake and take the road Evolène-Artsinol, which begins at the southwest end of the lake. At the fork, we take the direction Evolène; the pathway here drops quite rapidly.

At 1710m, the Evolène pathway zigzags through a forest zone damaged by the storm "Viviane" on February 27, 1990. Trees have been uprooted, twisted or broken. It is surprising to see how these zones affected by the storm are so localized; the strong winds rebounded in effect on the reliefs by hazard (other examples of such storm damage exist in Valais and in the Grisons) .

At 1680m at a fork, we descend to the right toward Evolène passing by more storm felled trees. At 1530m the path crosses the metalled road from Lanna. At this point we can either continue on the path directly to Evolène or make a detour in passing by picturesque Lanna, a historic village, which represents one of the first inhabited sites in the commune of Evolène (chalets built in a circle around a central prairie).
The village itself is built on both an alluvial terrace and a debris cone situated at the mouth of of the Merdesson Valley.

We should also note here the presence of a massive rock bar above Lanna-Flanmayens (*"l'Âla"*), which closes the valley to the north. **This bar constitutes a large glacial verrou joining up on the right bank with the Rocs de Volovron-La Garde** (crystalline gneissic basement, Nappe de Siviez-Mishabel). The concerted action of the glaciers (abrasion) and La borgne (deepening out) finally brought down this obstacle.
Nonetheless this rocky barrier **did obstruct the free flow of water as can be seen by the important alluvial deposits as far upstream as Les Haudères, filling the bottom of the valley**. The probable presence here of an ancient dammed lake most likely **explains the formation of the alluvial terraces of Lanna (left bank) and of Planchet (right bank)**. Today, La Borgne is vigorously cutting into these alluvial deposits as we can see from the regressive lateral talus erosion by the Lanna bridge.
On the right bank, large debris cones descend from the Sasseneire(the Martémo torrent). These active cones have now locally covered over the alluvial deposits facing the Lanna terrace.
Built on these alluvial terraces and near the debris cones, **the site of Evolène is relatively protected from flooding and high water. On the other hand, the end of the village going toward Les Haudères is menaced in certain places by rock falls emanating from the large rock face of quartzites and marbles (Nappe de Mont Fort) comprising the "Rocs de Villa".**
We should also note the para-avalanche barriers situated at about 2500m above Evolène, on the site of the Bletzure, which gives protection together with La Forêt des Planches (see the Daillec avalanches, 1945,1978 and 1980; the Martémo avalanches, 1910, 1970 and 1984).

However, these measures did not prevent the major avalanche of Sunday Feb. 21, 1999 that was responsible for the death of twelve persons and which reached the main road. To prevent a similar event taking place again, major rocky walls were built just above the village

We follow the road down to Evoléne. (Watch out for the traffic!)

The arrival at Evolène is via the bridge crossing La Borgne at 1341m (Route de Lanna); we then go up the road below the village and take one of the small back streets leading to the Evolène church (1371m).