

Assessment and promotion of cultural geomorphosites in the Trient Valley (Switzerland)

Valutazione e promozione di geomorfositi culturali nella Valle del Trient (Svizzera)

REYNARD E. (*), REGOLINI-BISSIG G. (*), KOZLIK L. (*),
BENEDETTI S. (**)

ABSTRACT – Within the framework of three cultural projects developed in the Trient valley (Switzerland) – the “Cultural Routes in Switzerland” (ViaStoria), the Alposcope, and Vallis Triensis – several projects aimed at the promotion of the geocultural heritage are being carried out. An inventory of cultural geomorphosites of the Trient, Eau Noire and Salanfe valleys aims at developing a database that will constitute the base for further projects. 39 cultural geomorphosites are being assessed by using a method that considers the scientific (geomorphological) and cultural values independently. A second inventory, developed within a larger international project on the importance of Goethe’s writings and observations for the development of Earth sciences, aims at comparing the German poet’s views with the current situation of several geomorphosites in the area. Several geotourist products, aimed at promoting the geomorphological importance of glacial processes in the valley, are proposed for school children and tourists.

KEY WORDS: Geomorphosites, Cultural sites, Heritage, Trient, Switzerland.

RIASSUNTO – Nell’ambito di tre iniziative culturali che hanno interessato la Valle del Trient (Svizzera) – “Vie Culturali in Svizzera” (ViaStoria), Alposcope, e Vallis Triensis – sono stati sviluppati numerosi progetti volti alla valorizzazione e promozione del patrimonio geoculturale della valle. L’inventario di geomorfositi culturali delle valli del Trient, Eau Noire e Salanfe ha lo scopo di sviluppare ed implementare un database che costituirà la base per progetti futuri. Sono stati così valutati 39 geomorfositi culturali utilizzando un metodo che considera il valore scientifico (geomorfologico) e quello culturale in modo indipendente. Un secondo inventario, svi-

luppato nell’ambito di un progetto internazionale più ampio sull’importanza degli scritti e delle osservazioni di Goethe per lo sviluppo delle Scienze della terra, ha lo scopo di comparare le osservazioni dello scrittore tedesco con la situazione attuale di molti geomorfositi nell’area. Vengono proposti numerosi prodotti geoturistici per turisti e ragazzi delle scuole, con lo scopo di promuovere l’importanza dei processi glaciali nella valle.

PAROLE CHIAVE: Geomorfositi, Beni culturali, Patrimonio, Trient, Svizzera.

1. – INTRODUCTION

Several scholars (PANIZZA & PIACENTE, 2003; PRALONG 2004; REYNARD & PRALONG, 2004) have demonstrated the potentialities of considering cultural heritage not only with respect to its human-made elements – archaeological vestiges, historical buildings, infrastructures, etc. –, but also in a broader sense, including the natural (biological and abiotic) elements of landscape. These studies open new opportunities in history education that is not restricted to the mere human history but covers longer periods, including the geological and natural history. New concepts such as geohistory (PANIZZA & PIACENTE, 2003), total history (PRALONG, 2004) or long history (P. Dubuis, oral com-

(*) Institute of Geography, University of Lausanne, Bât. Anthropole, CH – 1015 Lausanne – E-mail: Emmanuel.Reynard@unil.ch

(**) ViaStoria Suisse romande, Postbox 16, CH – 1890 St-Maurice

munication) may open new collaboration between sciences that are generally not, or poorly, connected (geology, geomorphology, archaeology, history, ethnography, heritage sciences, etc.). The aim of this interdisciplinary approach is to consider landscape as the result a chain of natural and human processes as they are perceived by society (DROZ & MIÉVILLE-OTT, 2005; REYNARD, 2005).

Starting from this integrated approach, several initiatives have emerged in Switzerland. One is the recent modification (2006) of the Nature and Landscape Protection Act that evolves from a legislation aimed at protecting individual natural or cultural objects to a more territorial and integrated approach, with the creation of new parks, aiming at the sustainable management of the rural landscape. Another case is the project of the 3rd Rhone River Corrections (started in 2000) that was developed with the clear objective of co-ordinating the protection of the population against floods, the rehabilitation of the ecological functions of the watercourse, and the social use of the river. The project managers have developed a large participative process and in this context, historians have created a network of studies aimed at the reconstruction of the long history of the river and its appropriation by society. Specialists of both natural and cultural sciences are involved in this network.

The Trient valley, in the Swiss part of the Mont-Blanc massif, is another place where scientists have developed a similar process of integration involving natural, cultural and social sciences. In this case, geomorphologists have taken the initiative and several projects are being carried out in order to improve the common knowledge of the valley's natural and human history. The objective of this paper is to present the first results of three studies that are currently being developed in the valley by the Institute of Geography at the University of Lausanne within the framework of broader cultural projects co-ordinated by the *ViaStoria* local office. All three projects aim at obtaining better knowledge and promoting cultural geomorphosites.

2. – CULTURAL GEOMORPHOSITES

Geomorphosites are geomorphological objects to which a value can be given (PANIZZA, 2001). The importance of the site may be purely scientific (restrictive definition, REYNARD, 2004a; 2005) or may also include other ecological, cultural, economic or cultural values (broader definition, REYNARD, 2004a; 2005). We have proposed to distinguish two levels of value (REYNARD, 2005): a central one (the

site's importance for the reconstruction of the Earth history; scientific value) and additional values that may be important in various contexts, such as, for example, tourism (see PRALONG, 2005).

In this sense, cultural geomorphosites are geomorphological objects that also have a cultural value. With respect to other geomorphosites, their use by Man gives them a higher value (LUGON & REYNARD, 2003). Examples of cultural geomorphosites are glacial locks supporting castles or defence infrastructures, archaeological findings linked with a specific geomorphological context (e.g. karstic caves, habitats in rockfall deposits) or particular landforms used for religious rituals (e.g. Uluru inselberg in central Australia, Lourdes karstic cave in Southern France).

3. – KNOWLEDGE AND PROMOTION OF THE TRIENT VALLEY HISTORY

Several projects are currently being carried out in the Trient valley. They have been launched after a Master's thesis study on the contribution of educational trails to sustainable development in the Alps (BENEDETTI, 1998). The first phase was dedicated to the development of several interpretative trails – supported by panels and brochures – in various parts of the valley and its surroundings, with the aim of contributing to the summer tourism in the area.

Currently, three more complex projects, all aiming at a better comprehension of the Alpine history, concern the valley: the “Cultural Routes in Switzerland”, the *Alposcope* and the activities of *Vallis Triensis*.

Under the label “Cultural Routes in Switzerland”, *ViaStoria* – Center for transport history research – is currently establishing a network of twelve historical routes (fig. 1) throughout Switzerland. “Cultural Routes in Switzerland” provides access to natural and cultural curiosities of the landscape, Swiss cultural historical peculiarities, spectacular evidence of the routes' landscape, known and less conventional historical means of transportation, the history of regional customs, and the products of the various regions. The entire program is led and co-ordinated by *ViaStoria* that collaborates with national, regional and local organisations for tourism, economy, and culture, and with the public services and transports. The project started in February 2004 and the twelve routes of national interest were opened in 2007 (www.viastoria.ch). One of them – the Via Cook – concerns the Trient valley.

Alposcope is a network linking natural and tourist sites together and aiming at describing the long history of the Alps (www.alposcope.ch). The project is viewed as a promotional instrument developed by and for the local communities. It aims at promoting the tourist infrastructures and the natural and cultural sites of the region situated between Chamonix (France) and Martigny (Switzerland) by following the principles of sustainable development. The Trient valley is the geographical core of the project. The long history of the Alps, from their geological formation to the hydropower scheme building (Emosson dam) at the end of the 20th century, constitutes the thematic core of the project. Geology and orogeny, landscape formation by glaciers and rivers, fauna and flora colonisation, prehistorical and historical development, the historical routes between Switzerland and France, as well as the development of tourism and alpinism, are the principal themes that are demonstrated by a transdisciplinary group of specialists of natural, historical and human sciences. The network links villages, natural and cultural sites, and communication means between Chamonix and Martigny, and aims at promoting a common tourist product.

Vallis Triensis is an association created in 1999 that aims at studying and promoting the value of natural, archaeological and historical sites of the Trient and Eau Noire valleys (www.vallistriensis.ch). The association organizes guided visits, field trips and conferences, and publishes a bulletin and thematic monographies concerning the region. To date, three books have already been published on the geology, geomorphology and archaeology of the area.

4. – INVENTORY OF CULTURAL GEOMORPHOSITES

In order to have a common view of the value and location of the geocultural heritage of the valley, an inventory of cultural geomorphosites has been carried out (KOZLIK, 2006). The aim was to select, describe and map the principal sites in the valley that have both a geomorphological and a cultural value. A first selection was made on the basis of precedent works on the geomorphology and the cultural heritage of the study area. 39 sites were selected (fig. 2) and each site was then described and assessed using a method developed at the University of Lausanne (REYNARD *et alii*, 2007).

A card is created for each site. It is divided in six parts (tab. 1): general data; description and morphogenesis; scientific value; additional values; syn-

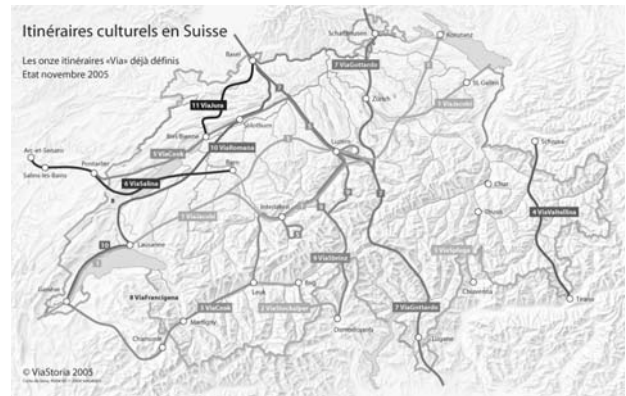


Fig. 1 — Map of the “Cultural Routes in Switzerland”.
– Carta delle “Strade Culturali in Svizzera”.

thesis; references. The assessment of the sites is based on two levels of values (REYNARD, 2004a): a central (scientific) value and several additional (cultural, aesthetic, ecological, social-economic) values. The scientific value is assessed using six different criteria (tab. 1): integrity, representativeness, rarity, paleogeographical, educational and geohistorical value. For each criterion, a qualitative evaluation is made, and numerical values (scores ranging from 0 to 1) may be added. The four additional values are assessed using simple criteria (table 1 presents only the cultural value). The fifth section (synthesis) is divided into three parts: a synthesis of the geomorphological value, a listing of potential threats by natural processes and/or human impacts, and finally, proposals of management measures. The inventory, which is currently implemented in an ArcGis application, is used by *Vallis Triensis* as a database for future actions and publications (KOZLIK *et alii*, 2009).

Table 1 presents the card of the erratic block called *Pierre Bergère* (fig. 3) that was used by Nobel Prize Guglielmo Marconi in 1895 for the first wireless experiments. The physician sent waves from the top of the block, while a local child working as an assistant moved around several parts of the surroundings and showed flags of different colors according to whether he could record the signal or not. In 2003, the Institute of Electrical and Electronics Engineers recognized the stone as a key-place in the history of electrical sciences and placed a commemorative plaque on the stone. The historical value of the block and Marconi's experiments in Salvan have been recognized and promoted in recent years by an association, the Marconi Foundation (www.fondation-marconi.ch). A small museum and a cultural trail were created, and a brochure was published. Each year, events around Marconi's fame are organised. Nevertheless, the origin of the block, its integration in a

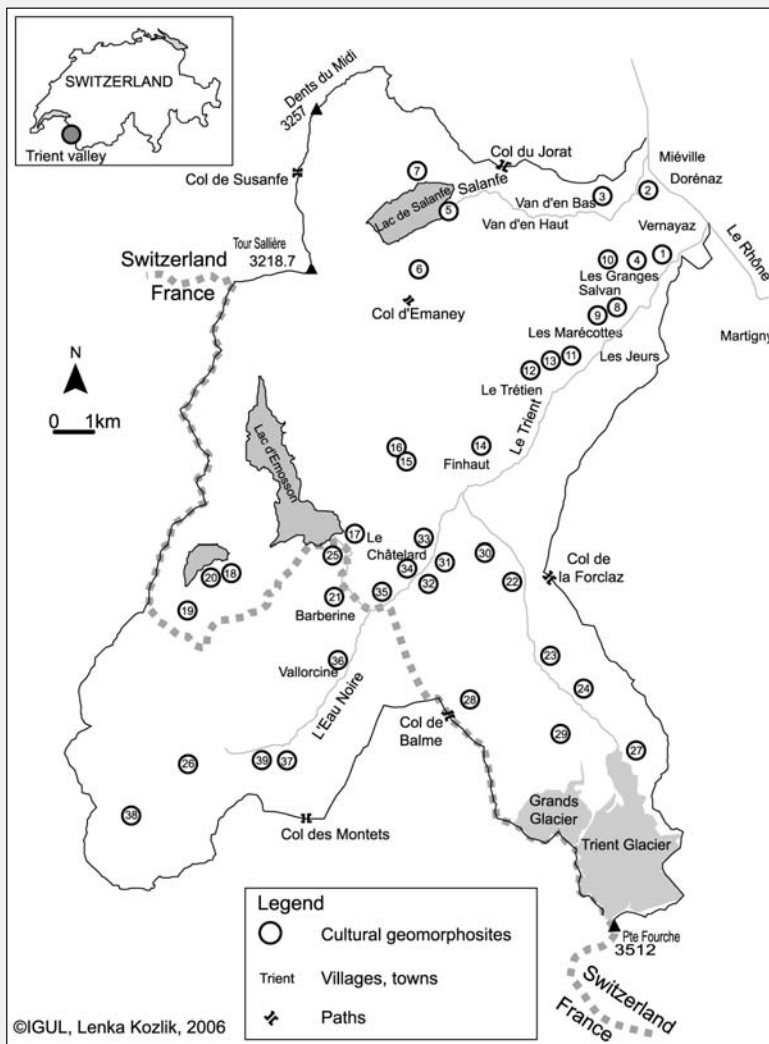


Fig. 2 – Map of the cultural geomorphosites of the Eau Noire, Trient and Salanfe valleys. 1. Trient gorges; 2. Pissevache waterfall; 3. Dailley gorge; 4. Stagecoach road Vernayaz-Salvan; 5. Salanfe glacial lock; 5. Salanfe mine; 7. Salanfe alp; 8. Pierre Bergère erratic block; 9. Salvan rupestral engravings; 10. Salvan shelter for plague victims; 11. Les Marécottes natural swimming-pool; 12. Triège gorge; 13. Stagecoach road Salvan-Finhaut; 14. Le They *roches moutonnées*; 15. Fenestral moraines; 16. Fenestral stèle; 17. Emosson chapel; 18. Vieux-Emosson glacial lock; 19. Vieux-Emosson dinosaur tracks; 20. Vieux-Emosson landscape; 21. Barberine waterfall; 22. Trient moraines; 23. Trient irrigation channel; 24. Trient glacier path; 25. Emosson glacial lock; 26. Bérard natural reserve; 27. Trient glacier; 28. Herbagères alp; 29. Les Grands alp; 30. Tête Noire gorge; 31. Les Jeurs mill stone; 32. Les Jeurs cupule stone; 33. Le Châtelard Häs-sig factory; 34. Le Châtelard rockfall shelter; 35. Le Châtelard hole; 36. Stagecoach road Finhaut-Vallorcine; 37. La Poya cupule stone; 38. Bérard stone; 39. Bérard waterfall and cave.

– Carta dei geomorfositi culturali delle valli Eau Noire, Trient e Salanfe. 1. Gole del Trient; 2. Cascata del Pissevache; 3. Gola del Dailley; 4. Strada per diligenza Vernayaz-Salvan; 5. Sbarramento glaciale di Salanfe; 5. Miniere di Salanfe; 7. Alpe di Salanfe; 8. Blocco erratico Pierre Bergère; 9. Incisioni rupestri di Salvan; 10. Ricovero per le vittime della peste; 11. Piscine naturali Les Marécottes; 12. Gola del Triège; 13. Strada per diligenza di Salvan-Finhaut; 14. Roches moutonnées Le They; 15. Morene di Fenestral; 16. Stèle di Fenestral; 17. Cappella Emosson; 18. Sbarramento glaciale Vieux-Emosson; 19. Tracce di dinosauri di Vieux-Emosson; 20. Paesaggio di Vieux-Emosson; 21. Cascata di Barberine; 22. Morene del Trient; 23. Canale di irrigazione di Trient; 24. Sentiero glaciale di Trient; 25. Sbarramento glaciale di Emosson; 26. Riserva naturale di Bérard; 27. Ghiacciaio del Trient; 28. Alpe di Herbagères; 29. Alpe di Les Grands; 30. Cascata di Tête Noire; 31. Ruota di mulino di Les Jeurs; 32. Les Jeurs cupule stone; 33. Stabilimento Le Châtelard Häs-sig; 34. Difesa dai crolli a Le Châtelard; 35. Cavità a Le Châtelard; 36. Strada per diligenza di Finhaut-Vallorcine; 37. La Poya cupule stone; 38. Bérard stone; 39. Cascata e grotta a Bérard.

larger glacial geomorphological system, with *roches moutonnées* and striated rocks, as well as the relationships between the glacial landforms and the presence of archaeological findings (cupule stones) were very poorly developed. Two interpretative panels on the valley morphogenesis and on the glacial history were, therefore, prepared (KOZLIK *et alii*, 2008) and added to the cultural itinerary in summer 2008.

5. – THE SCIENTIFIC VALUE OF GOETHE'S TRAVELS IN SWITZERLAND

Like many other intellectuals in his time, Wolfgang Goethe (1749-1832) travelled in the Alps and through Italy several times. Frequent travelling throughout Europe started in the 17th Century by the young aristocracy undertaking the *Grand Tour*, which brought them to European centres of cul-

tural, political, economic and religious life (ASHWORTH, 1993). Later, alpine stays in the Swiss and French Alps were included (DEBARBIEUX, 1995).

The growing interest in natural sciences during the 18th century made the mountain environment one of the most praised sites of observation and experimentation (DEBARBIEUX, 1995) and the *voyage savant* (scientific travel) became a common form of travelling, especially for intellectuals (BRIFFAUD, 1994). Goethe's interest for geology developed in 1776, when he was charged with the supervision of a copper and silver mine in Illmenau (Thüringen, Germany) (GNAM, 2001). First, Goethe mainly took care of the legal and the economic aspects, but he also felt eager to inform himself about technical questions. As a result, his mineralogical and geological interest grew and he began to visit the mines and the ironworks in the surrounding area. Later, he undertook adventurous journeys in the surrounding areas and through Switzerland and Italy.

Tab. 1 – *Assessment card of the Pierre Bergère erratic block in Salvan (cultural geomorphosite n°8 on fig. 2).*
 – Scheda di valutazione del masso erratico Pierre Bergère a Salvan (geomorfosito culturale n°8 in fig. 2).


Pierre Bergère		TRIGLA003	
1. General data Localisation Swiss coordinates Altitude Type Size Property	Salvan, Valais, CH 567.750/107.730 950 m a.s.l. PCT (punctiform) 95 cubic meters Terrain: private property Block managed by the Marconi foundation (but remains a private property)		
2. Description The site is situated NE of Salvan village, on a hill situated near the church. It is formed by two glacial landforms: the erratic block and an outcrop of abraded and striated <i>roches moutonnées</i> . The block is made of augen gneiss from the Mont-Blanc massif. It is 3.5 metres long at the base and 6 metres long at the top; it is 5 metres high and 4 metres large. Several human installations are present near and on the block: scale, orientation, table, barrier, and bench. The block is situated on a large area covered with <i>roches moutonnées</i> and locally known as <i>Rochers du soir</i> (Evening rocks). These are rocks from the Salvan-Dorénaz permo-carboniferous syncline that have been abraded by the Trient glacier. The block is situated on a high point and gives a large view of the area. It can also be viewed from various points. The <i>Pierre Bergère</i> is very close to the Salvan rupestral engravings (cultural geomorphosite n° 9) that are situated on the same <i>roches moutonnées</i> outcrop.			
Morphogenesis During the Quaternary, glaciers coming from the Mont-Blanc massif modelled the Trient valley shape. The glacier abrasion was more important in the South-eastern part of the valley, made of soft sedimentary rocks. Differential erosion has modelled several longitudinal ridges separated by depressions. The <i>Pierre Bergère</i> is located on one of the elongated hills of the area. During the glacier retreat, the Trient glacier has abandoned several erratic blocks (melt-out till); one of them is the <i>Pierre Bergère</i> .			
3. Scientific value	Assessment		Score
Integrity	The site is highly modified by human settlements, on the block itself (scale, panels) and around it (asphalted road, individual house).		0.20
Representativeness	The size and the position of the blocks on striated <i>roches moutonnées</i> is a good example of erratic blocks in the area.		0.80
Rarity	There are numerous other erratic blocks in the valley. Nevertheless, the size of the block and its location are relatively uncommon.		0.80
Paleogeographical value	The block does not give any information on a glacial stage.		0.20
Educative value	Possible explanations on glacial processes (abrasion, striation, melt-out) and landforms (<i>roches moutonnées</i> , striaes, erratic blocks, glacial locks and depressions).		0.80
Geohistorical value	The position of the block allowed the first wireless experiments by G. Marconi in 1895.		1.00
Scientific value	The site is representative of ancient glacial processes, but the natural characteristics are poorly conserved.		0.63
4. Cultural (additional) value	Assessment		Score
Religious importance	No known religious activities.		0.00
Historical importance	Legend: the first pasture place in Salvan (which explains the name Pierre Bergère: Shepherd Stone) 1895: first wireless experiments by G. Marconi		1.00
Literature and artistic importance	Several writings on Marconi and wireless experiments Presence in Salvan of Marconi Foundation and Museum		1.00
Cultural value	Because of the block and Marconi's experiments, Salvan is known as one of the world's cradles of telecommunications.		0.67
5. Synthesis			
Values	The natural environment is poorly conserved, but the block is a key-site in telecommunication history. The geomorphosite, therefore, has a high cultural importance		
Potential threats	The block is situated in Salvan village and could be damaged by human activities.		
Management measures	The value of the block should be formally recognised and the block should be protected. The management should be insured by the Marconi Foundation.		
6. References			
FOURNIER Y. (1996/2000). <i>Salvan : sur les pas de Marconi - Following Marconi's footsteps</i> , Salvan (booklet).			
COQUOZ L. (1899). <i>Salvan- Fins-hauts avec petite notice sur Trient</i> , Imp. Ch. Pache, Lausanne.			
Website: www.fondation-marconi.ch			



Fig. 3 – A view of the *Pierre Bergère* where Guglielmo Marconi made the first wireless experiments in 1895 before being awarded the Nobel prize (picture E. Reynard).

– *Panoramica di Pierre Bergère dove Guglielmo Marconi fece i primi esperimenti nel 1895 prima della vincita del premio Nobel (immagine E. Reynard).*

During his second journey to Switzerland in 1779 he met a professor of geology and physics, Horace Bénédict de Saussure in Geneva, who suggested visiting some interesting places. On de Saussure's recommendations, Goethe trained his awareness for geological phenomena and started collecting minerals (GNAM, 2001). For his third journey to Switzerland in 1797 Goethe had a clear scientific and encyclopaedic aspiration: to acquire information about the economic situation, local customs as well as climatic, geographic and geologic facts of the places he visited (CHIADÒ RANA, 2003). Therefore, a rich amount of letters, diary notes, poems and drawings concerning naturalistic

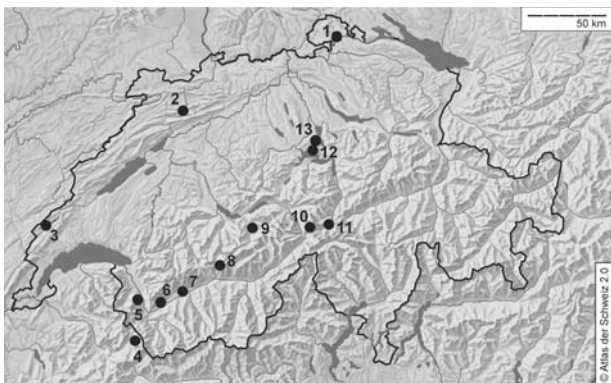


Fig. 4 – Map of the geomorphosites visited and described by Goethe during his travels in Switzerland. 1. Rhine waterfall; 2. Moutier cluse; 3. Joux syncline valley; 4. Mer de Glace glacier; 5. Pissevache waterfall; 6. Rhone meanders; 7. Sion glacial lock; 8. Leukerbad thermal spring; 9. Staubbach waterfall; 10. Rhone glacier; 11. Schölenen gorge; 12. Weggis landslide; 13. Küssnacht erratic block.

– *Carta dei geomorfositi visitati e descritti da Goethe durante i suoi viaggi in Svizzera. 1. Cascata di Rhine; 2. Montier cluse; 3. valle a sinclinale del Joux; 4. Ghiacciaio Mer de Glace; 5. Cascata Pissevache; 6. Meandri del Rhone; 7. Sbarramento glaciale di Sion; 8. Sorgente termale di Leukerbad; 9. Cascata di Staubbach; 10. Ghiacciaio di Rhone; 11. Gola di Schölenen; 12. Frana di Weggis; 13. Masso erratico di Küssnacht.*

observations cover his travels to Switzerland.




Within the framework of a German-Swiss-Italian project (GEYER *et alii*, 2007), a comparison of Goethe's views and the current aspect of several sites in Germany, the Czech Republic, Austria, Switzerland and Italy, is being carried out by researchers of various countries. The objective is to confront Goethe's views and theories with the current knowledge, in order to understand the German poet's importance in the development of Earth sciences, to assess the processes that have transformed the sites visited by Goethe, and finally to develop a virtual journey in Goethe's footsteps. In Switzerland, 13 sites have been selected (fig. 4); one of them, the *Pissevache* waterfall (tab. 2), is situated in the Trient valley area. The compilation of the scientific value of the site, the natural and human-forced waterfall evolution, and the listing of the main descriptions and paintings of the site are in progress. The information is organised in a database (tab. 2) and the results will also be used as material within the framework of the *Cultural Routes of Switzerland*.

6. - THE GLACIAL HISTORY FOR SCHOOLS AND TOURISTS

The third project has been developed within the framework of the *Alposcope* project. The aim is to combine geomorphological evidence of glaciations (erratic blocks, *roches moutonnées*), active glacial processes (Trient glacier) and glacial landforms showing the adaptation of the hydrographical network to the former glacial history to explain to school-children and tourists the importance of glaciers in the morphogenesis of the area.

Two thematic itineraries were prepared within the framework of a Master's thesis (SCHNEIDER, 2009). The first one (fig. 5) is a cycling road from Martigny to Monthey (20 km in length). In Martigny, the Rhone valley makes a 90-degree change in direction and the river crosses the geological units perpendicularly. The crystalline basement, a permocarboniferous syncline and sedimentary covers are successively crossed. Because of the alluvial deposits, the itinerary is almost flat. That is not the case of the bedrock that is about 600 meters below the current valley level in Martigny, where the glacial abrasion was quite important, whereas in St-Maurice the bedrock is visible and has created an impressive glacial lock that is currently cut by a gorge eroded by the Rhone River (REYNARD *et alii*, 2009). The itinerary allows the observation of different glacial and fluvial landforms clearly visible in the landscape (educational value). Seven stops are pro-

Tab. 2 – *Descriptive card of the Pissevache waterfall used within the Goethe project.*
– Scheda descrittiva delle cascate Pissevache utilizzata nel progetto di Goethe.

On Goethe's path				
Index 5	Name Pissevache	Country Switzerland	Region Western Switzerland	Canton Valais
Localization				Illustrations
				
<input type="checkbox"/> history of geology <input type="checkbox"/> geology in general <input type="checkbox"/> stratigraphy <input type="checkbox"/> petrography <input type="checkbox"/> mineralogy		<input type="checkbox"/> sedimentology <input checked="" type="checkbox"/> geomorphology <input checked="" type="checkbox"/> cultural geomorphology <input checked="" type="checkbox"/> geotourism <input type="checkbox"/> meteorology		<input type="checkbox"/> natural sciences <input type="checkbox"/> archaeology <input type="checkbox"/> history <input type="checkbox"/> history of art
Goethe's description				Geoscientific value
<p>Wir wussten, dass wir uns dem berühmten Wasserfall der Pissevache näherten, und wünschten einen Sonnenblick, wozu uns die wechselnden Wolken einige Hoffnung machten. An dem Wege betrachteten wir die vielen Granit- und Gneisstücke, die bei ihrer Verschiedenheit doch alle eines Ursprungs zu sein schienen. Endlich traten wir vor den Wasserfall, der seinen Ruhm vor vielen andern verdient. In ziemlicher Höhe schiesst aus einer engen Felskluft ein starker Bach flammend herunter in ein Becken, wo er in Staub und Schaum sich weit und breit im Wind herumtreibt. Die Sonne trat hervor und machte den Anblick doppelt lebendig. Unten im Wasserstaube hat man einen Regenbogen hin und wieder, wie man geht, ganz nah vor sich. Tritt man weiter hinauf, so sieht man noch eine schönere Erscheinung. Die luftigen schäumenden Wellen des obern Strahls, wenn sie gischend und flüchtig die Linien berühren, wo in unsern Augen der Regenbogen entsteht, färben sich flammend, ohne dass die aneinanderhängende Gestalt eines Bogens erschiene; und so ist an dem Platze immer eine wechselnde feurige Bewegung. Wir kletterten dran herum, setzten uns dabei nieder und wünschten ganze Tage und gute Stunden des Lebens dabei zubringen zu können.</p> <p>Saint-Maurice, den 7. November 1779, In: <i>Briefe aus der Schweiz</i> (1796)</p>				<p>The Pissevache waterfall is a site of high geocultural value. It was one of the most frequently visited spots in the Alps in 17th and 18th century tourism</p>
Today's description				
<p>Being a major tourist attraction for travellers of the romantic epoch, the Pissevache waterfall is praised in the first <i>Récits de voyage</i>. It inspired, for example, Haller, Goethe, Rousseau and the Alpine poet Emile Javelle and is, furthermore, very much represented in the Alpine iconography. Due to the implementation of the hydroelectric installation of Salanfe in 1953, the Salanfe River suffered from a strong reduction of its flows. As a result the Pissevache no longer resembles the waterfall of the romantic period. Nevertheless, the geomorphologic value of the waterfall is undeniable: it is one of the most beautiful examples of postglacial waterfalls in Switzerland. Although the Pissevache appears in many publications concerning the Valais, the site lacks a real tourist and cultural promotion (no publication or tourist equipment). Its proximity to the gorges of Trient and the alluvial fan of the St-Barthélémy (see fig. 5) gives the site a great tourist and educational potential, which waits to be exploited.</p>				
Accessibility		How to get there		
<input type="checkbox"/> walk <input checked="" type="checkbox"/> car <input type="checkbox"/> boat <input type="checkbox"/> public transport		<p>The Pissevache waterfall is visible from the A9 motorway and the railway, but can only be reached by the district road.</p>		
Bibliography				
<p>REICHARD, 1793 / ESCHASSERIAUX, 1806 / TÖPFFER, 1836 et 1842 / GAUTHIER, 1868 / COQUOZ, 1899 / REVAZ, 1983 / METTAN, 1991 / REICHLER & RUFFIEUX, 1998 / REYNARD, 2004</p>				

posed (fig. 5); they each propose explanations on one kind of glacial and postglacial process.

The first one is the Trient gorge (cultural geomorphosites n°1 in fig. 2) where postglacial fluvial erosion by a river charged with abrasive crystalline gravels has cut a profound and narrow gorge linking the tributary Trient River with the Rhone River valley. An interpretative trail has been available since 2004. The second stop is the Pissevache waterfall, already described in the last section (tab. 2). The third stop is an example of another type of tributary valley linking with the main valley: the alluvial fan. The St-Barthélémy alluvial fan is one of the most impressive in the Rhone River valley. It is fed with the debris of shales coming from the sedimentary Morcles nappe and it has pushed the Rhone River to the other side of the valley (REYNARD *et alii*, 2009). Stop number 4 is in St-Maurice, a historic town that is considered as the entrance to the Rhone River valley because of its strategic position in the narrowest part of the valley (glacial lock). This stop provides an opportunity to discuss the importance of the glacial erosion in the valley's shape, but also the links between geomorphology and human history. Stop number 5 is situated on the lee side of the glacial lock, where glacio-fluvial

processes have been active. A glacial pothole, that was discovered and is managed by a local farmer, is visible. The sixth stop is also situated on the lee side of the glacial lock and shows impressive *roches moutonnées* and striated rock walls that are used for rock climbing. This stop is the occasion not only to present glacial landforms but also to discuss the issues concerning the management of geomorphosites and the possible conflicts with other recreational activities. The last stop is the *Pierre des Marmettes* erratic boulder in Monthey. This is the largest erratic block in Switzerland and Jean de Charpentier described it in his famous *Essai sur les glaciers* in 1841 that is considered as one of the first glaciology books in the world. Because of an important popular and scientific mobilisation against its destruction by an extraction company in 1905, it was bought and placed under the protection of the Swiss Natural Sciences Society in 1908 (SCHARDT, 1908). This is, therefore, one of the first protected geomorphosites in Switzerland (REYNARD, 2004b) and it gives a good opportunity to remember the importance of geology and geomorphology in the history of nature conservation movement in Switzerland.

The second educational itinerary is a hiking trail along the Trient River valley, from the Trient glacier to mouth in the Rhone River. The itinerary, which is divided into 10 stages, may be done in two days, with a possible stop in Finhaut, where tourist accommodation is available (see figure 2 for location of visited sites). As for the first itinerary, the glacial history of the valley is the main topic and the importance of glaciers in the regional economy and history is also demonstrated. The beginning of the itinerary is situated at the Forclaz pass, accessible by public transportation from Martigny. The first two stops (n° 23 and 27 on figure 2) concern the Trient glacier from the Little Ice Age to the present. The Trient glacier is a very dynamic one and the tongue is evolving very fast with climate variations. During the Little Ice Age, the glacier was also used for ice production and a dynamic economy has been active for several decades. This makes it a good example of the possible use of geomorphology from an economic point of view. The village of Trient (stop 3, n° 22, figure 2) is built on and around a moraine ridge dating back to the Egesen stage. The itinerary continues with the Tête Noire gorge, which is a good example of a U-shaped glacial valley (stop 4, n° 22, figure 2). From Finhaut to Vernayaz, the itinerary follows the former *Route des diligences*. The hiker will stop to see several geomorphosites that present various traces of the local glacial history (Le They *roches moutonnées*, n° 14; Triège postglacial gorge, n° 12; Les Marécottes *roches moutonnées*, n° 11; Pierre

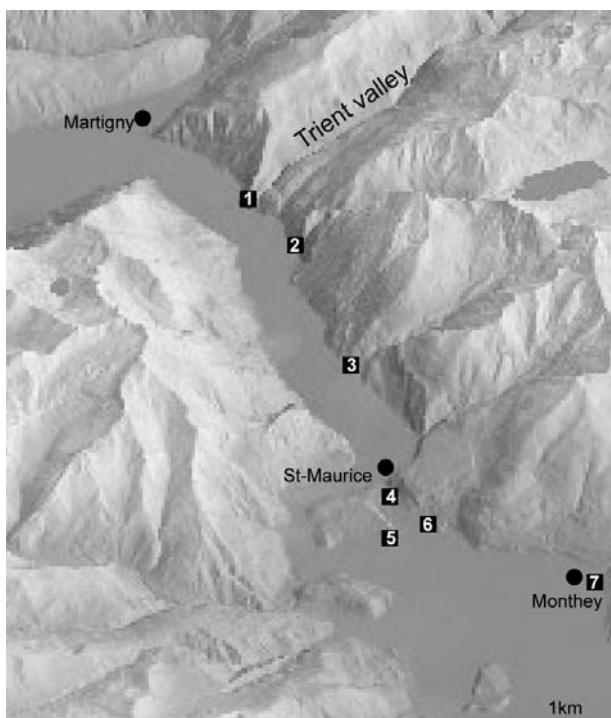


Fig. 5 - Map of the Geomorphosite Cycle Road Martigny-Monthey. 1. Trient postglacial gorge; 2. Pissevache waterfall; 3. St-Barthélémy alluvial fan; 4. St-Maurice glacial lock; 5. Bex glacial pothole; 6. Massongex *roches moutonnées* outcrops; 7. Pierre des Marmettes erratic block.

– *Carta dei Geomorfositi lungo la Pista Ciclabile Martigny-Monthey*. 1. Gola postglaciale di Trient; 2. Cascata di Pissevache; 3. Cono alluvionale di St-Barthélémy; 4. Sbarramento glaciale di St-Maurice; 5. Marmitta dei giganti di Bex; 6. Affioramento di *roches moutonnées* di Massongex; 7. Masso erratico di Pierre des Marmettes.

Bergère erratic boulder, n° 8; Salvan *roches moutonnées* covered with prehistoric paintings, n° 9) and finishes in the Trient gorge (n° 1, figure 2). All the visited sites are described using the assessment card presented in this paper (tab. 1) and both itineraries will be included in the *Alposcope* tourist offer.

7. – CONCLUSIONS

This paper aimed at presenting several initiatives developed in the Trient valley (Western Switzerland) with the objective of assessing and promoting the geocultural heritage of the area. An inventory of cultural geomorphosites was carried out. It constitutes the base for the preparation of various geotourist products (educational trails, panels and leaflets). A second inventory is being carried out within the framework of an international project on Goethe's importance for the development of Earth sciences in the 18th century. All these projects aim at promoting the idea of the integrative nature of landscape that is anchored both in the natural and cultural sciences.

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